1974 at the Northeastern Station

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FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE
NORTHEASTERN FOREST EXPERIMENT STATION
6816 MARKET STREET, UPPER DARBY, PA. 19082
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FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE, UPPER DARBY, PA.

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NORTHEASTERN FOREST EXPERIMENT STATION
F. BRYAN CLARK, STATION DIRECTOR ● 1975

1974: GENERAL

1974 WAS A YEAR of many changes at the Northeastern Forest Experiment Station.

F. Bryan Clark is the new Station Director. Clark came to the Station in June from the North Central Station to become Deputy Station Director, a new position created under the reorganization of Forest Service research administration. When Warren T. Doolittle, former Station Director, was called to Washington to serve as Director of Timber Management Research in September, Clark was appointed to succeed him.

R. Duane Lloyd was appointed to fill the position of Deputy Station Director. Lloyd had served for 3 years as Principal Recreation Scientist on the Forest Environmental Research staff at the Forest Service Washington headquarters.

Thomas E. Hamilton became Assistant Station Director for Planning and Application—a new position. Previously he had served as Assistant Station Director for Economics, Survey, Marketing, and Utilization.

Both Lloyd and Hamilton are stationed at the Experiment Station's headquarters at Upper Darby, Pa.

Under the Station reorganization, three Assistant Station Directors in charge of continuing research moved from Upper Darby to the field, closer to the programs they administer, the problems they must solve, and the people they serve.

Daniel M. Schmitt, formerly Assistant Director for Timber Management Research, now has headquarters at Durham, N. H. He has responsibility for research programs in Maine, New Hampshire, Vermont, Connecticut, Massachusetts, New York, and New Jersey.

Eldon W. Ross, formerly Assistant Director of Insect and Disease Research, is stationed at Delaware, Ohio. He is Assistant Station Director for research in Ohio and Pennsylvania.

A third post, at Morgantown, West Virginia, was filled by Samuel F. Gingrich, formerly a Project Leader at our Columbus, Ohio, laboratory. His research area covers projects in Kentucky, West Virginia, Maryland, and Delaware.

James L. Bean recently retired from his assignment as Program Manager for gypsy moth research, with headquarters at Hamden, Connecticut.

Isabel T. Duffy came to the Station from the Southern Station in New Orleans. She fills the Public Information Officer's post left vacant when Hal Marx transferred to Washington as Research Applications Staff Assistant.

RESEARCH HIGHLIGHTS

We do not have space to describe the entire Station research program and the activities and accomplishments of all its projects; so we present here a few brief highlights of the Station's research activities and accomplishments.

Regional and National Forestry Research Planning

Considering the wide variety of forestry issues today, how can we be sure that our research programs are directed toward the highest priority problems? Is the Station's program well coordinated with other forestry research in the Northeast? How do our studies contribute to solution of National research needs?

To help answer these questions, the Northeastern Station has joined with forestry schools in the Northeast to identify high-priority problems and to plan for future research activity. Fifteen special groups, made up of top scientists, have been asked to prepare a master plan for Northeastern forestry research in their particular areas of expertise. These plans will not only guide regional forestry research, but will also be used for National forestry-research planning.

Pinchot Institute Program Going and Growing

As our population continues to grow, more and more attention has been turned toward managing our natural resources to fill the needs of people in urban and suburban environments. Research is needed to guide our planning and policy decisions. The Pinchot Institute for Environmental Forestry Research was established to help meet these needs.

The Pinchot Institute was established in 1970 to coordinate an interdisciplinary research program directed toward the improvement of urban environments through manipulation and management of urban forests and open space. The Institute provides a way of coordinating research efforts between universities and the Forest Service. Research is carried out by two Station research units at Amherst, Mass., and Pennington, N. J., and the Institute's Consortium for Environmental Forestry Studies. The Consortium is made up of nine universities in the densely populated regions of the Northeast. Consortium research planning is done through seven specialized workshop groups. Overall research efforts are coordinated through an executive committee of elected representatives from member institutions.

The Pinchot Institute Consortium has sponsored 68 studies of environmental forestry problems during the past 5 years. In 1974, $291,000 was contributed through research grants and cooperative studies to support 21 studies, covering a wide spectrum of problems in forest amenities, tree genetics, wildlife, recreation, and urban landscape values.

The Station and the Consortium are cooperatively sponsoring three symposia in 1975: (1) the Meaning of Natural Environments to Children (19-23 May, Washington, D. C.); (2) Planning and Management of the Metropolitan Physical Environment (25-29 August, Syracuse, N. Y.); and (3) Selection and Breeding of Trees for Densely Populated Urban Areas (5-6 November, Washington, D. C.)

Gypsy Moth Program Expanded

The gypsy moth research, development, and application program has received a helpful boost. Congress provided additional funds for fiscal year 1975 to assure that the program can be expanded and accelerated.

Objectives of the 4-year expanded program are (1) to implement the available technological improvements for reducing losses from and spread of the gypsy moth, and (2) to develop and evaluate new short- and long-term forest- and pest-management systems to effectively prevent, contain, and suppress infestations of gypsy moth.

Priorities have been set to assure that several new control techniques will be operational within 4 years. As each control method becomes operational, it will be added to the USDA integrated control system, designed to capitalize on the best features of each technique—and avoid environmental hazards.

Population Dynamics and Ecology of Forest Insect Pests

A mathematical model for predicting dispersal of gypsy moth larvae suggests that most windblown larvae are deposited within ½ mile of their source and are not blown long distances. Intensive evaluation of *Blepharipa scutellata* R-D., an important parasite of gypsy moth, indicates that its effectiveness is limited by high overwinter mortality. A method for rearing this parasite in the laboratory has recently been developed.

Milestones in Gypsy Moth Virus Research Program

In the gypsy moth virus program—seeking ways to use viruses to control gypsy moth populations — several important milestones were reached in 1974. The virus program was presented at an international meeting in Spain; and the Hamden gypsy moth nucleopolyhedrosis virus was adopted as the international standard for comparative purposes. Three required safety tests have been completed; all data indicate no adverse effects due to the virus. A large-scale mass production of the virus was completed, and successful production of the virus in a tissue-culture system has been demonstrated and is being evaluated. An aerial field test of the virus was conducted in Pennsylvania, with encouraging preliminary results. Effective working relationships have been developed with EPA, which will help implement the virus registration effort.

Wood Borer Damages to Appalachian Oak

A study in West Virginia, Ohio, and Kentucky showed that oak borers cause damage evaluated at $24 for every 1,000 board feet of red oak factory-grade lumber produced. Total loss from wood-borer damage in standing sawtimber in the three-state area is estimated at half a billion dollars a year. Cumulative losses are due to the combined effects of such pests as the red oak borer, carpenterworm, and oak timberworm.

Pheromone Developed in Battle to Control Bark Beetle that Carries Dutch Elm Disease

Suppression of Dutch elm disease has depended upon controlling the activities of the smaller European elm bark beetle, *Scolytus multistriatus*. Multilure, a synthetic aggregation pheromone for the beetle, has been developed in a cooperative effort by entomologists and chemists at the Station and the State University of New York at Syracuse. Pheromone-baited traps have already proved a superior tool for delineating the distribution of this beetle, detect its presence in new locations, and monitor its emergence patterns. The potential of mass-trapping elm bark beetles at pheromone-baited traps for massive reduction of beetle populations and suppression of Dutch elm disease incidence is now being evaluated.

Forest Tree Foliage Removes Pollutants from Air

Research to determine the importance of trees in removing gaseous pollutants from the atmosphere demonstrated that both ozone and sulfur dioxide are rapidly removed from the air by the foliage of forest trees. This information, along with knowledge of sorption rates of several tree species, may be used by urban or freeway planners in positioning trees or greenbelts to reduce pollutant levels.

Basic Biology: Meristems and Morphogenesis in Trees

We need more basic information about how new cells are formed by the meristems at the tips of shoots and in the cambium. Information about how the thin-walled new cells develop into wood and other tissues also is inadequate. This is part of the complex problem of morphogenesis. What controls the development of cells and tissues so that they assume

the shapes and functions of specific organs or parts while the whole organism develops into a tree of integrated form and function?

One approach to the problem is to isolate the microscopic apical meristems from shoot tips and to observe their growth and development in aseptic culture under laboratory conditions. After the technical difficulties of doing this had been overcome, it was found that meristems in culture release soluble substances that interact at a distance from the tissue to produce and deposit various materials related to the lignins and polysaccharides of wood. These procedures offer a new method of studying the synthesis of lignin and other wood components.

Another way of studying morphogenesis in trees is to read and interpret the record of cambial behavior that is encoded in the anatomy of wood cells. From a study of this type it was learned that, when coniferous trees are released and radial growth increases, there also is a sudden increase in height of rays. There is evidence that such increases in ray size may persist much longer than the stimulus that evoked them. This kind of basic biological information helps provide a scientific basis for development of intensive forest management procedures.

Combining Economics with Silviculture in Selection Cutting

An individual-tree selection procedure, combining economic and silvicultural guidelines, was developed for nine hardwood species. One consideration in cut-or-leave decisions is: what is an acceptable rate of return?—2 percent? 4 percent? 6 percent? In practice this procedure is applied as a flexible diameter limit, using low, medium, and high rates of return for oak site indexes 60, 70, and 80. Other considerations in marking are growth rates and changes in log quality and tree vigor for a 10-year period.

Patch Clearcutting and Northern Hardwood Ecosystems

Research at Hubbard Brook, New Hampshire, has thrown new light on aspects of northern hardwood ecosystems. For example, take patch cutting, which is often recommended to improve wildlife habitat and esthetic values. One question is how it affects evapotranspiration (a reduction in evapotranspiration means increased water yields downstream). Analyses of vegetation and soil-water potentials, climate, and plant anatomical characteristics indicate that a number of patch clearcuttings will not reduce evapotranspiration as much as a single clearcutting equivalent in size to the combined acreage of the patch cuttings.

Use Small Land Units in Planning Timber-and-Wildlife Management

Some forests should be managed for the production of wildlife as well as timber. Because most wildlife species need two or more successional stages of forest in their habitat, maintaining relatively stable populations of these wildlife species throughout a forest rotation can best be assured by attaining a balanced distribution of age classes of trees throughout the forest. And because the home ranges of most wildlife species are relatively restricted, tree age-class distribution must be regulated by much smaller units of land than would be necessary for timber production alone. The key to successful regulation of tree age classes for combined timber and wildlife production is long-term planning of cutting schedules for *small* units of land. This will help stabilize wildlife populations. It also will permit determining how much management for wildlife benefits will reduce timber yields.

Selection Cutting Requires Control of Diameter Distribution

Many people have the idea that sustained yield is automatic under any form of partial cutting in which trees are individually marked; but this is not true. True selection cutting for sustained yield requires continual control of the diameter distribution throughout the entire range of diameters desired. A paper has been written to show what is required to make selection cutting work, and to show that application of various misnamed types of "selection" cutting will result in wide fluctuations in timber yield. The kinds of forest in which sus-

tained yield is high priority is distinguished from those in which a less critical form of selection or group-selection cutting may be used. This should lead to a higher level of professional application of selection cutting.

Fertilizing Cherry Seedlings Stimulates Early Flowering

Genetic improvement in forest trees is a slow process, due in part to the long time required for selected progeny to mature and produce seeds. In a study on the Allegheny National Forest in Pennsylvania, it was found that nitrogen and phosphorous fertilization of black cherry seedlings in a seed orchard stimulated early flowering just 4 years after planting. Fertilizers also improved survival and produced increases of 145 percent in basal area and 50 percent in height growth of some half-sib families. There were large differences in response among families. These results suggest that it may be possible to reduce the time required for cherry seed orchards to produce seed. Furthermore, the dramatic growth differences between some families suggest that it may be possible to select families that are especially responsive to fertilization for future intensive culture.

Research Aids Maple Syrup Business

Maple—wood, sap, and syrup—is big business in Northeastern hardwood regions. Research by Station scientists at Burlington, Vermont, has helped to stimulate a gradual change from the independent producer-processor-retailer business to an industry that has distinct production, processing, brokerage, and retail functions. Three useful state-of-the-art publications related to sap production (including design and layout of plastic-tubing sap-collection systems), silvicultural prescriptions for converting natural stands to productive sugarbushes, and recommendations for storing sugar maple seeds to promote maximum germination, were published by the Station, the first two in collaboration with State and Private Forestry and extension foresters.

Creating Habitat for Birds in Populated Areas

How does one manage woodlands to enhance bird-watching? Much relevant information is available, scattered in technical journals, but little in how-to-do-it form. So Station scientists have translated technical information into a practical guide for managing trails, sites, and plant species and growth stages with respect to area dimensions and design. They suggest managing for many birds of many different species, near trails and other human-activity centers, and for natural-looking nesting habitat.

The Market for Recreation

Increased public awareness of outdoor recreation opportunities provided by forests has stimulated another kind of research—prediction of demand for outdoor recreation. Our scientists at Durham are leaders in research on the campground sector of recreation markets. They recently published a comprehensive bibliography of camping markets. They also collaborated in a two-part analysis of the campground market in the Northeast. The second part, covering the private sector, was published in 1974; it provides a complete evaluation of the current private campground market in the Northeast.

New Tree and Log Grades for Hardwoods Tested

Before newly developed log and tree grades can be put into use, they must be tested for reliability and ease of application. The new hardwood tree grades have been tested on an independent sample of trees. A workshop was held at the Fernow Experimental Forest in West Virginia to explain the new tree grades and give the participants an opportunity to apply the grades in the field. Personnel from Research, State and Private Forestry, and the National Forest System participated.

Forest Survey

Recent inventories in Vermont and New Hampshire revealed little change in forest-land area over the last decade. But per-acre grow-

ing-stock volume has increased in Vermont from 880 cubic feet in 1966 to 1,068 cubic feet, and in New Hampshire from 970 cubic feet in 1960 to more than 1,400 cubic feet. Annual net growth averaged 44 cubic feet per acre in New Hampshire and 21 cubic feet in Vermont. Vermont's lower growth rate resulted from poorer stocking in growing-stock trees. In both States, growth exceeded removals by more than 2-to-1. The latest inventory of Vermont reinforces 1965 findings that considerable stand improvement is required if the State's forests are to produce at full potential.

Availability of Timber

As part of the survey of Vermont and New Hampshire, a study was made to obtain information about the owners of private land, how much of their timber is available for harvesting, what other uses they have for their land, and their attitudes about and plans for their land. One finding was that, though less than 20 percent of the owners in these States had harvested timber from their forest land, the acreage they owned was about two-thirds of the total private commercial forest land. These and other findings from this canvass should provide valuable guidance to foresters and other resource managers in reaching the forest landowner and meeting his needs.

New Markets for Bark

In the past, bark produced at Appalachian sawmills and veneer mills was burned or dumped as a waste product. But during the 1970s a variety of markets have been developed for bark residues. Our research has shown that, for producing steam, bark costs less than any other industrial fuel. To aid in the development of bark markets and uses, our researchers have developed yield tables for bark residues; the tables provide bark-residue weights per log (by log-scale volume) for eight important Appalachian species.

Better Sawing Method for Low-Grade Logs

At most Appalachian sawmills, low-grade hardwood logs cannot be processed efficiently by conventional grade-sawing methods. Consequently, live-sawing (sawing a log through-and-through, without turning) has been studied as an alternative method for mills that do not have resaw equipment. The live-sawing method results in significant gains over grade-sawing in lumber production rates, overrun, and average lumber value.

Engineering Research in Timber Harvesting

Harvesting hardwood timber from steep Appalachian slopes causes objectionable damage to the environment in many places. Poorly constructed logging roads contribute to erosion and sedimentation. On logging jobs where many roads are constructed, the area as seen from a public road is unsightly. One approach toward alleviating this problem is the use of skyline cable logging. A small skyline system tested on the Fernow Experimental Forest showed promise for minimizing this environmental problem.

Computer Program Developed for Whole-Tree Chipping System

By using a whole-tree chipping system, more wood fiber can be produced from every acre of forest harvested. But integrating a whole-tree chipper into a logging system is difficult. So many variables must be considered to achieve balance, minimum cost, and efficient operation. A computer program has been developed for doing this. The best cost picture results when the capabilities of fellers, skidders, and trucks are balanced with the capability of the chipper.

Research on Reclaiming Mined Lands

Research, emphasizing reclamation of surface-mined areas in the Appalachians, continued to add to our knowledge of the best ways of placing mine spoils and of revegetating them.

Highest yields of sediment from surface-mined watersheds occurred during the first 6 months after mining. They diminished to low levels within 3 years. Information on the physical and mechanical properties of specific spoil

materials can be used to plan placement of mine spoil so that outslopes of spoil banks are more stable. Unstable banks contribute to erosion and sedimentation.

Getting herbaceous cover growing on mine spoils is an important way of reducing erosion and sedimentation. Studies in Kentucky and West Virginia have shown that herbaceous cover can be established within 60 days of seeding. Seeding can be done any time between March 1 and October 15.

It has been found that mulches and soil stabilizers help control erosion directly but are not essential for getting vegetation established on surface-mined areas in Kentucky and West Virginia. Lime, fertilizer, and mulch *were* found to be necessary for establishing herbaceous cover on refuse banks from bituminous deep mines in Pennsylvania.

When planted on the same areas as tree seedlings, grasses and herbs did not affect survival of the young trees. However, they did suppress tree growth until the legumes became the dominant herbs. Then tree growth was enhanced.

In studies of planting containerized tree seedlings, plastic tubelings were found to be more susceptible to frost-heaving than peat pots or Jiffy-7 containers.

Application of fly-ash to acid mine spoils lowered spoil density, neutralized acidity, increased plant-available phosphorous, and increased subsurface moisture, all of which should help plants grow on these sites.

PUBLICATIONS

in 1974 by staff members and cooperators of the Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture

In 1974, Station personnel and their cooperators were credited with more than 300 publications—in scientific and trade journals, popular periodicals, Department of Agriculture publications, symposium proceedings, and Station papers, notes, and general technical reports.

Publications and reprints that are available, in limited numbers, are marked with asterisks (*). If you want a publication, ask for it by author's name, date, and title. Address requests to the Northeastern Forest Experiment Station, 6816 Market Street, Upper Darby, Pa. 19082.

*Arner, Stanford L.

1974. **Profile—A computer program for displaying the geometric relationships of the responses in a factorial design.** USDA For. Serv. Res. Pap. NE-288. 21 p., illus.

Profiles are plots of the sample means of each level of one factor at each level of one or more of the other factors in an experiment. The author presents a computer program that produces profiles of the experimental means and discusses the interpretation of these profiles.

Aubertin, G.M.

[1974] **Problems and techniques in sampling water for analysis.** Univ. Ky. Symp. on Use of Small Watersheds in Determining Eff. of For. Land Use on Water Qual. Proc.: 1-9. Lexington.

A discussion of some problems encountered and techniques utilized in obtaining stream and lake-water samples for physical and chemical analysis.

*Aubertin, G.M., and J.H. Patric.

1974. **Water quality after clearcutting a small watershed in West Virginia.** J. Environ. Qual. 3(3): 243-249.

A 34-hectare gaged watershed on the Fernow Experimental Forest, Parsons, West Virginia, was conventionally clearcut in 1969. Streamflow increased 20 cm during the first year after cutting, but rapid and luxuriant revegetation reduced the flow increase to only 6.4 cm during the second year. Water quality remained high. Success in avoiding damage to water quality was attributed to careful road management, retention of a forest strip along the stream, and rapid, lush vegetative regrowth after clearcutting.

*Auchmoody, L. R.

1974. **Nutrient composition of blades, petioles, and whole leaves from fertilized and unfertilized yellow-poplar.** USDA For. Serv. Res. Note NE-198. 5 p.

Nitrogen (N) and phosphorus (P) concentrations in leaf blades and petioles obtained from three fertilized and three unfertilized yellow-poplar sample trees were determined annually during a 4-year period. Concentrations were substantially higher in blades than in petioles. Fertilization increased N and P concentrations in blades, but petioles showed only a slight increase in N and a decrease in P. Because blades were more responsive to changes in external nutrient supply than petioles, and because fertilization affected the composition of blades and whole leaves unequally, blades give a more sensitive and accurate measure of nutrient concentration than petioles or whole leaves.

Barger, Jack H., and Kenneth Helrich.

1974. **Evaluation of aerial applications of Gardona for gypsy moth suppression.** (Abstr.) Entomol. Soc. Am. North Cent. Branch Annu. Meet. 29: 179-180.

In a 1972 field test, Gardona sprayed by helicopter failed to affect gypsy moth egg-mass counts or defoliation estimates. Apparently this was because the formulation failed to

adhere to foliage, the area received above-average precipitation, the spray deposit and residue were highly variable, and the chemical was insufficiently toxic under field conditions.

*Barnard, Joseph E., and Teresa M. Bowers.
1974. **A preview of New Hampshire's forest resource.** USDA For. Serv. Res. Note NE-197. 5 p.

Forest continues to be the dominant land use in New Hampshire. Three inventories of the State between 1948 and 1973 showed little change in the total forest area but significant shifts in forest type and stand size. Average volume per acre has increased to over 1,400 cubic feet and 2,785 board feet. Growth continues to exceed removals.

*Barnard, Joseph E., and Teresa M. Bowers.
1974. **A preview of Vermont's forest resource.** USDA For. Serv. Res. Note NE-196. 6 p.

Forest land occupies 75 percent of the total land area in Vermont. Nearly one-half of this forest land is occupied by the beech-birch-maple forest type. The inventory data show volume increasing but at a lower rate than in neighboring states. This is due to large losses from cull and mortality. Total growing-stock volume is now 4.7 billion cubic feet.

Barnard, J.E., and Larry Letourneau.
1974. **Data processing systems for large inventories.** Soc. Am. For. Inventory Work. Group Workshop Proc.: 141-149. Fort Collins, Colo.

Inventory data processing is viewed as an integral part of forest inventory design. FINSYS, a specific automatic data processing system for processing forest inventory data, is described. The development, use, and flexibility of this system are demonstrated with examples.

Bate, L.C., W.S. Lyon, and E.H. Wollerman.
1974. **Gold tagging of elm bark beetles and identification by neutron activation analysis.** Radiochem. Radioanal. Lett. 17(1): 77-85. Akademiai Kiado, Budapest.

Living elm bark beetles briefly immersed in an aqueous solution of gold chloride 0.01 percent and placed on elm twigs (their natural food) for 12 days showed survival of 47 percent as compared with 76 percent survival among controls. Effect of this labelling on flight of the beetles must be determined before this method can be used for estimating beetle populations.

Beaton, John A.
1974. **Sensitometry—its uses.** [USDA For. Serv. SE. Area S&PF] Seed X-ray Symp. Proc.: 85-92, illus. Macon, Ga.

A simple system is described that explains the use of sensitometry for (1) film selection based on contrast enhancement and (2) optimum film performance by adjusting exposure density. Relative film speeds, methods of exposure correction, and means of describing exposures are also discussed.

*Bevins, M.I., T.L. Brown, G.L. Cole, K.J. Hock, and W.F. LaPage.
1974. **Analysis of the campground market in the Northeast. Report II. Privately owned areas.** Vt. Agric. Exp. Stn. Bull. 679. 29 p.

The results of a 1971 interview survey of 529 commercial campground operators in 12 Northeastern States, including the characteristics of successful and unsuccessful campground enterprises: size, location, facilities, services, costs, and returns. Also includes a financial analysis of 292 enterprises and the relationship between gross income and 30 selected factors. Describes marketing and pricing practices of campgrounds and discusses the industry's growth prospects.

Blum, Barton M.
1974. *ARALIA* **L.: Aralia.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 220-222, illus.

A summary of the flowering, fruiting and seeds of the genus Aralia, with notes on collection, extraction, and storage; pregermination treatments; and nursery practice.

Blum, Barton M., and Arnold Krochmal.
1974. *EPIGEA REPENS* **L.: Trailing arbutus.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 380-381, illus.

A summary of growth habit, distribution, and use; flowering and fruiting; collection of fruits and extraction and storage of seeds; germination; and nursery and field practices.

*Blyth, James E., and James T. Bones.

1974. **Pulpwood production in the Northeast and North Central States for 1973.** North. Logger 23(3) : 16.

Pulpwood production between 1972 and 1973 increased 20 percent in the 21-State area, and all subregions (New England, Middle Atlantic States, Central States, and Lake States) contributed significantly to the higher output. These statistics and others resulted from a complete canvass of woodpulp mills conducted annually by the Forest Service Experiment Stations in the East. The article contains 1973 pulpwood statistics by States and sources of pulpwood, and the number of mills that were operating.

*Bones, James T., and David R. Dickson.

1974. **The veneer industry in the Northeast—1972.** USDA For. Serv. Resour. Bull. NE-33. 13 p., illus.

From a survey of veneer producers in the Northeast in 1972, veneer-log production and receipts by States and species, and log shipments between States and regions are presented. Comparisons are made with a similar survey made in 1968. A current list of northeastern veneer manufacturers is included.

*Bones, James T., and David R. Dickson.

1974. **Pulpwood production in the Northeast, 1973.** USDA For. Serv. Resour. Bull. NE-37. 19 p., illus.

An annual report based upon canvasses of pulpwood production in the Northeast, containing data about pulpwood production from roundwood in the 14 Northeastern States by counties and species groups, and pulpwood chip production from plant residues. Comparisons are made with the previous year's production data. Trends in pulpwood production for the past 11 years are shown. Also included is a list of the woodpulp mills that were operating in the region in 1973.

*Bones, James T., N. Engalichev, and W. G. Gove.

1974. **The timber industries of New Hampshire and Vermont.** USDA For. Serv. Resour. Bull. NE-35. 25 p., illus.

The results of a complete survey of the timber industries in New Hampshire and Vermont. The report contains statistics about roundwood production and receipts, and production and disposition of the manufacturing residues that result. Comparisons are made with the most recent previous surveys, and trends in industrial wood output are noted.

Bonner, F. T., and John A. Crossley.

1974. *VITIS LABRUSCA* **L.: Fox grape.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 853-854, illus.

A revision and updating of information on this genus from the 1948 Woody Plant Seed Manual. Distribution, use, reproduction, collection of fruits and seeds, germination, and nursery practices are discussed; and fruit, seeds, and germination are illustrated.

Bormann, F.H., G.E. Likens, T.G. Siccama, R.S. Pierce, and J.S. Eaton.

1974. **The export of nutrients and recovery of stable conditions following deforestation at Hubbard Brook.** Ecology Monogr. 44(3) : 255-277.

Deforestation and growth repression for 3 years increased particulate matter export to a maximum of 38 metric tons $km^{-2}yr^{-1}$—about 15 times export from the hardwood forested ecosystem. Export was exponential with the greatest increase the third year. The average ratio of net annual export of dissolved substance to particulate matter was 2.3 in the mature ecosystem and > 8.0 during the first 2 years after deforestation. Nutrient flux and erosion losses returned to previous levels with increased biotic regulation.

Brodie, John E., and Jean Nolley.

1974. **Maryland's primary wood industry: a utilization summary and directory.** Md. For. Serv. Dep. Nat. Resour. 59 p. Annapolis.

A primary wood-industry directory useful to buyers and sellers of roundwood, secondary manufacturers, and industrial planners. A resumé of the industry's functional characteristics and concentration is also provided. The directory includes names and addresses of sawmills, loggers, concentration yards, and 10 other primary wood industries in Maryland. Sugar maple producers and pallet mills are also listed. Detailed information in-

cludes special equipment used, products purchased and sold, principal species sawn, and annual production.

*Campbell, Robert W.

1974. **Relation between overstory composition and subsequent defoliation by the gypsy moth.** J. For. 72: 142-143, illus.

The percentage of favored food in the overstory was closely related to the subsequent level of defoliation by the gypsy moth. Thus the silvicultural recommendations that are based on the "favored-food" theory may be valid with respect to abating the damage done to the forest by this insect.

*Campbell, Robert W.

1974. **Relationships between overstory composition and gypsy moth egg-mass density.** USDA For. Serv. Res. Note NE-191. 6 p.

Most of the silvicultural recommendations for reducing the hazard of gypsy moth outbreaks have been based in part on the premise that gypsy moth density levels are related closely to the proportion of favored food trees in the overstory. This premise did not prove to be true for a series of plots observed in eastern New England between 1911 and 1931.

*Campbell, Robert W., and Joseph P. Standaert.

1974. **Forecasting defoliation by the gypsy moth in oak stands.** USDA For. Serv. Res. Note NE-193. 7 p., illus.

A multiple-regression model is presented that reflects statistically significant correlations between defoliation by the gypsy moth, the dependent variable, and a series of biotic and physical independent variables. Both possible uses and shortcomings of this model are discussed.

Collins, E.B., and K.C. Elliott.

1973. **Possible power sources for forest industry use.** W. Va. Univ. Agric. Exp. Stn. 70 p. Morgantown.

A review of different methods of power production, both old and new, including solar energy, fuel cells, rotary engines, gas and diesel engines, external combustion engines, and battery power. The stage of development of each power unit and current or future applications as stationary or mobile sources of power are discussed.

*Conner, R.N., and H.S. Crawford.

1974. **Woodpecker foraging in Appalachian clearcuts.** J. For. 72: 564-566.

In mixed oak stands, downy and hairy woodpeckers ate insects they found under the bark of abundant logging debris left 1 year after clearcutting. Flickers ate ants and fruits found on the ground in an area clearcut 5 years previously. A 12-year-old clearcut area was used only occasionally by all these birds. A mature uneven-aged stand was used substantially by downy, hairy, and pileated woodpeckers, but not by the common flicker.

Core, Earl L.

1974. **Brambles.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 16-19.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Core, Earl L.

1974. **Red mulberry.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 106-107.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Core, Earl L.

1974. **Spireas.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 132-133.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Crawford, H.S. and I.R. Porter.

1974. **Upland hardwood-bluestem.** *In* Range resources of the South. Ga. Agric. Exp. Stn. Bull. NE-9: 17-19.

The upland hardwood-bluestem type occupies about 46 million acres in parts of Tennessee, northern Mississippi, southern Missouri, northern Arkansas, and eastern Oklahoma and considerable acreage in several more northern states. Oaks are the most abundant tree species, composites the most abundant forbs, and little bluestem, big bluestem, Indiangrass, switchgrass, and native legumes

the most abundant cattle forage plants in late spring and early summer. Where successfully established, fescue provides cool-season forage.

Cromer, Jack I.

1974. **American bittersweet.** *In* Shrubs and vines for Northeast wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 10-11.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Crossley, John A.

1974. *VACCINIUM* **L.: Blueberry.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 840-843, illus.

A new genus added to the revision of the 1948 Woody Plant Seed Manual. Distribution, use, reproduction, collection of fruits and seeds, germination, and nursery practices are discussed.

Crossley, John A.

1974. *SOLANUM DULCAMARA* **L.: Bitter nightshade.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 777-778, illus.

A revision and updating of information on this genus from the 1948 Woody Plant Seed Manual. Distribution, use, reproduction, collection of fruits and seeds, germination, and nursery practices are discussed; and fruit, seeds, and germination are illustrated.

Crossley, John A.

1974. *MALUS* **Mill.: Apple.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 531-534, illus.

A revision and updating of information on this genus from the 1948 Woody Plant Seed Manual. Distribution, use, reproduction, collection of fruits and seeds, germination, and nursery practices are discussed; and fruit, seeds, and germination are illustrated.

Curtis, Willie R.

1974. **Sediment yield from strip-mined watersheds in eastern Kentucky.** Natl. Coal Assoc. Res. and Appl. Tech. Symp. on Mined-Land Reclam. Proc. 2: 88-100. Louisville, Ky.

Measurements of sediment accumulation in debris basins below surface-mined lands in eastern Kentucky show highest sediment yield during the first 6 months after mining. The erosion rate diminishes to fairly low levels within 3 years. Methods of mining and handling spoil affect sediment yield, as does the speed with which vegetative cover is established.

Curtis, Willie R.

[1974] **Introduction.** Univ. Ky. Symp. on Use of Small Watersheds in Determining Eff. of For. Land Use on Water Qual. Proc. Lexington.

We are leaving a period of land surplus and entering a period of increased competition for land, resulting in increased needs for management of both these lands and associated water resources. It is not enough to say certain land uses will not be allowed to impair water quality; rather, alternatives with predictable consequences must be provided. Much of the data for determining such alternatives can be obtained from study of small watersheds.

Davidson, Walter H.

1974. **Reclaiming refuse banks from underground bituminous mines in Pennsylvania.** Natl. Coal Assoc. Symp. Mine and Prep. Plant Refuse Disposal Proc. 1: 186-199. Louisville, Ky.

Results of studies on the composition of waste from underground bituminous mines and techniques for establishing vegetation on mine-waste piles. Chemical and physical analyses of spoil from 79 different sites showed such wide divergence of characteristics that no trends could be established. Field plantings on five sites, using lime, fertilizer, and hardwood bark mulch as amendments, showed that all three were necessary to establish herbaceous cover. Tree survival did not appear to be greatly influenced by the amendments. Weeping lovegrass, K-31 tall fescue, and Korean lespedeza were tested. Red pine was the only tree species used.

Davidson, Walter H., and Edward A. Sowa.

1974. **Early attempts to vegetate coal-mine spoils with container-grown seedlings.** North Am. Containerized For. Tree Seedling Symp.: 372-376. Great Plains Agric. Counc. Publ. 68, Denver, Colo.

Afforestation attempts with Ontario and other plastic tubelings indicated that frost-heaving can be extremely detrimental on bituminous coal-mine spoils. Of the containers tested, peat pots and Jiffy-7s were found to be most resistant to frost-heaving. Compared with bare-root seedlings, seeded red pines in peat pots and Jiffy-7 containers performed well.

*Davidson, Walter H., and Edward A. Sowa.
1974. **Container grown seedlings show potential for afforestation of Pennsylvania coal-mine spoils.** Tree Planters' Notes 25 (4) : 6-9.

Afforestation attempts with Ontario-type and other plastic tubelings indicated that frost-heaving can be extremely detrimental on coal-mine spoils. Other types of containers—peat pots and Jiffy-7s—were found to be more resistant to frost-heaving. Compared with bare-root seedlings, seeded red pines in these containers survived and grew equally well.

Davis, Grant.
[1974] **Team approach to watershed ecosystem analysis.** Univ. Ky. Symp. on Use of Small Watersheds in Determining Eff. of For. Land Use on Water Qual. Proc.: 79-82. Lexington.

Environmental research has shifted from a piecemeal approach to one of ecosystem analysis through multidisciplinary team efforts. This has resulted both from a change in philosophical viewpoint and advances in computer science that makes possible use of complex models. Small watersheds are ideal ecological units for such a multidisciplinary approach to ecosystem analysis. Forested watersheds that have been partially strip-mined are useful examples for developing complex ecosystem models.

DeGraaf, Richard M., and Jack Ward Thomas.
1973. **A strategy for wildlife research in the city—the Forest Service program.** Northeast. Wildl. Conf. Trans. 29: 29-44.

The management of city habitats for wildlife production (especially songbirds and non-game mammals) for aesthetic enjoyment will require extensive coordinated research to provide guidance for such efforts. A generalized framework for such research is suggested. Studies being conducted by the Forest Service research unit at Amherst, Mass., are described.

DeGraaf, Richard M., and Jack Ward Thomas.
1974. **A strategy for wildlife research in urban areas.** *In* Wildlife in an urbanizing environment: 53-56. Univ. Mass. Holdsworth Nat. Resour. Cent. Plann. and Dev. Ser. 28. Amherst.

Control of pest species has been the main application of wildlife management in urban areas, but now a new research and management responsibility emerges; the provision of wildlife solely for enjoyment. A research program is proposed in three broad areas: (1) human preferences, (2) habitat requirements, and (3) human-wildlife interaction.

DeGraaf, Richard M., and Jack Ward Thomas.
1974. **A banquet for the birds.** Nat. Hist. 83 (1) : 40-45, illus.

A study of the economics of feeding wild birds revealed that in 1971, residents of Amherst, Massachusetts, spent an average of $8.80 per family for this activity. An estimated $3.4 million was spent on this activity in Massachusetts in 1971. Data from five major cities are presented (New York, Boston, St. Louis, Milwaukee, and Cleveland) and also a discussion of the possible ecological effects of bird-feeding.

*Despard, Thomas L.
1974. **Avoid problem spoils through overburden analysis.** USDA For. Serv. Gen. Tech. Rep. NE-10. 4 p., illus.

During strip-mining of coal and subsequent grading operations, indiscriminant placement of toxic overburden strata at the spoil surface creates reclamation problems that are difficult and expensive to correct. Evaluation of overburden material before mining is begun is suggested as the most reliable means of predicting spoil quality and devising a reclamation plan. This can best be accomplished by core-drilling the proposed area and submitting the recovered core samples to a laboratory for chemical analysis. Color, pyrite content, and pH are field

guides used to determine the potential toxicity of exposed overburden strata.

Dochinger, Leon S.

1974. **An assessment of air-pollution injury to American forests.** Sylwan 9: 63-68.

Ozone, fluorides, and sulfur dioxide cause most of the air-pollution problems in American forests. The nature and effects of these pollutants and minor aerial phytotoxicants are discussed.

*Dochinger, Leon.

1974. **Air pollution problems in nurseries.** New Horizons: 1-5. Hortic. Res. Inst., Washington, D.C.

Chronic air pollution can threaten green survival and cause imbalances in the composition of plant communities. Major research investigations are suggested along with the need for cooperative action among private and government agencies for protecting nursery and ornamental crops in a polluted environment.

*Donley, David E.

1974. **Wood borer losses in Appalachian oak.** South. Lumberman 229(2848): 115, 116, 118, illus.

Cooperative research between entomologists of the USDA Forest Service and Appalachian lumber producers reveals that wood borers are responsible for $50,000,000 worth of oak quality loss each year in West Virginia, Kentucky, and Ohio. This estimate of loss came from double-grading of lumber produced from mill-run logs taken from 14 timber-harvest areas. Lumber grade changes caused value reductions of $25 M board feet for Ohio oak, $19 M for West Virginia oak, and $26 M for Kentucky oak. Borer losses to standing timber in the three-state area will add up to almost half a billion dollars.

*Donley, David E., C.J. Hay, and J.R. Galford.

1974. **Wood borer impact on Ohio oak.** Ohio Woodlands 12(2): 4-5 14, illus.

Annual losses of between $2,000,000 and $3,000,000 to oak products in Ohio are being caused by a complex of wood-boring insects. By 1972 lumber values, borers reduce the value of factory-grade red oak lumber some $24 per thousand board feet of lumber produced. Ohio's white oak cooperage value is reduced about 7 percent by borers. Insects most responsible for these losses have been identified as the red oak borer, the white oak borer, the oak timberworm, and two species of carpenterworms.

*Donnelly, John R.

1974. **Shoot size significantly affects rooting response of sugar maple softwood cuttings.** USDA For. Serv. Res. Note NE-184. 4 p., illus.

Three hundred softwood cuttings were collected from each of three mature sugar maple trees to test the effect of shoot size on adventitious root formation. One of the trees was a good rooter (61 percent rooted); one was a poor rooter (19 percent); and the third was a non-rooter (1 percent). Long cuttings rooted better than short cuttings and thick cuttings tended to root better than thin ones for one study tree; for the other tree, relative shoot thickness within a length class had no effect on rooting.

*Donnelly, John R., and Harry W. Yawney. [1973]. **Some factors associated with vegetatively propagating sugar maple by stem cuttings.** Int. Plant Propag. Soc. Annu. Meet. Proc. 1972: 413-430, illus.

This report summarizes results of several studies designed to stimulate rooting and overwintering survival of sugar maple stem cuttings collected from mature trees. Results indicated that: (1) timing collection of cuttings is critical for maximum rooting response; (2) rooting response is directly correlated with thickness and length of cuttings; (3) hormone treatments showed mixed responses between cuttings collected from different trees; (4) watering potted rooted cuttings during winter storage with sugar and nutrient solutions did not increase overwintering survival; and (5) overwintering survival appears to be correlated with rooting vigor.

Donohoe, Robert W.

1974. **Sweet crab apple.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 29-31.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Donohoe, Robert W.

1974. **American hornbeam.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 86-88.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Doolittle, W.T.

[1974] **Some thoughts on the nature of watershed research needed for environmental policy decisions.** Univ. Ky. Symp. on Use of Small Watersheds in Determining Eff. of For. Land Use on Water Qual. Proc.: 83-87. Lexington.

Public concern and Federal legislation have brought about requirements for more intensive investigation of the impact of man's activities on his environment. Forest management is one area that has come under close scrutiny. Much additional research needs to be conducted on the environmental effects of forestry practices, and these needs are cited in detail. In addition, the desirability of establishing regional environmental programs is outlined, and the necessity of interagency cooperation and communication is stressed.

Dorn, Donald E., and L.R. Auchmoody.

1974. **Scheduling timber cutting for sustained yield of wood products and wildlife.** Timber-Wildl. Manage. Symp. Proc.: Mo. Acad. Sci. Occas. Pap. 3: 33-43.

If you want to manage a forest for long-term sustained yield of both timber and wildlife, this paper explains one way to go about it. The key is careful planning of cutting schedules for relatively small units of land.

Dorn, Donald E., and L.R. Auchmoody.

1974. **Progress report: Effects of fertilization on vegetative growth and early flowering and fruiting of seed orchard black cherry.** Northeast. For. Tree Improv. Conf. Proc. 21: 6-18, illus.

Nitrogen and phosphorous fertilization of seedlings 2 years after planting in an Allegheny National Forest seed orchard containing 17 half-sib black cherry families has shown that fertilization reduced mortality, increased growth as much as 145 percent, and promoted early flowering in some families. The growth response varied dramatically among families, suggesting that responsiveness to fertilizers will be an important selection criterion in further genetic improvement work with black cherry.

Eabry, Steve.

1974. **Mountain-ashes.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 98-101.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

*Echelberger, Herbert E.

1974. **Poor "Promotion-itis"?** J. Travel Res. 12(3): 5-6, illus.

Ski areas that cater to local skiers are receiving a poor return on investments in radio, television, and newspaper advertisements. Managers wanted to know how the effectiveness of their promotion programs could be improved. Types of advertising easily recalled by skiers and the effect of knowledge of skier origin and characteristics provide managers with a basis for developing more productive promotion campaigns.

Echelberger, Herbert E.

1974. **Environmental perception and urban forestry.** Univ. Wis. Urban For. Conf. Proc.: 17-28, illus.

Management of urban forests must reflect the social needs of the clientele as well as the biological needs of the stand. Knowledge of urban forest resources, urban forest purposes, and urban forest user expectations is needed during the formulation of urban forest-management policy. Man's perception of and preferences for natural environments are reviewed, followed by description of a study under way to measure viewer reactions to several timber-harvesting techniques.

Echelberger, H.E.

1974. **Timber management and aesthetics: a dilemma.** N. Y. For. 31(2): 21-23.

The impact that logging has on the beauty of a forest is one reason why foresters are questioned about the wisdom of some of their management techniques. A search for ways to improve the visual and physical conditions of a forest after a logging operation is described. A contribution to alleviating the

problem of timber management lies in development of a better local market for at present unmarketable logging residue.

*Echelberger, Herbert E., Daniel H. Deiss, and Douglas A. Morrison.

1974. **Overuse of unique recreation areas: a look at the social problems.** J. Soil and Water Conserv. 29(4): 173-178, illus.

A survey of skiers and hikers in Tuckerman Ravine in the White Mountain National Forest of New Hampshire revealed that different user populations perceive overuse of the area in different ways. Users were aware of their impact on each other. Attitudes toward five management alternatives to relieve the overuse problem were explored. Deterioration in the quality of experience provided by unique recreational areas such as Tuckerman Ravine are discussed. The Forest Service has limited overnight use to the carrying capacity of the open-faced shelters in the ravine.

Fay, Stephen, and R.E. Leonard.

1974. **Back-country research in the Northeast.** Maine For. Rev. 5: 16.

Areas accessible primarily by foot-path are increasing in importance for hiking, cross-country skiing, snowmobiling, and trail-biking. A research program begun by the Forest Service in 1972, concerned with the problems of back-country management, is briefly described.

Federer, C. Anthony.

1974. **Young vs. old forests.** [Letter to the editor.] Am. For. 80(7): 5.

The author disputes several points made by Fred C. Simmons in articles about wilderness in the East. There is no scientific evidence for differences in streamflow quantity or air quality between old forest and young forest. We do not need vigorous forests to produce oxygen.

Federer, C. Anthony, and Glendon W. Gee.

1974. **Tree water stress in relation to water yield in a hardwood forest.** Univ. N. H. Water Resour. Res. Cent. Res. Rep. 7. 30 p.

Stomatal resistance, xylem potential, soil-water potential, stem diameter, net radiation, air temperature, humidity, and wind were measured through a summer in a northern hardwood forest and on sunny and shady edges of clearings. Stomatal resistance was also related to phenology in spring and autumn. The measurement of stomatal resistance is an important new tool for studying the water relations of hardwood forests.

Federer, C.A., and G.W. Gee.

1974. **Diffusion resistance and xylem potential in stressed and unstressed northern hardwood trees.** (Abstr.) Agron. Abstr. 1974: 11.

Daytime stomatal resistance of mature trees in New Hampshire averaged 2.5 s/cm for *Betula alleghaniensis,* 3.0 s/cm for *Acer saccharum,* and 3.4 s/cm for *Fagus grandifolia.* This implies the possibility of different transpiration rates among the species. When rain was prevented from entering the soil for 3 weeks, stomata closed partially during the day, presumably limiting transpiration and growth.

*Ferguson, Roland H., and Carl E. Mayer.

1974. **The timber resources of Delaware.** USDA For. Serv. Resour. Bull. NE-32. 42 p., illus.

A statistical and analytical report of the second forest survey of Delaware. Trends in forest-land area, timber volume, annual growth, and timber removals are discussed. Timber-products output by forest industries, based upon a canvass of industries in 1970, and the importance of timber to the State's economy are also discussed. The report includes an outlook for timber supplies during the next 30 years and a discussion of forest-management opportunities.

*Ferguson, Roland H., and Carl E. Mayer.

1974. **The timber resources of New Jersey.** USDA For. Serv. Resour. Bull. NE-34. 58 p., illus.

A statistical and analytical presentation of the second forest survey of New Jersey. Trends in forest-land area, timber volume, annual growth, and timber removals are discussed. Timber-products output by forest industries, based upon a canvass of industries in 1970, and the importance of timber to the State's economy are also discussed. The report includes an outlook for timber supplies during the next 30 years and a discussion of forest-management opportunities.

Frank, Robert M.

1974. **Options for and probable benefits of timber stand improvement in Maine.** Maine For. Rev. 6: 2-4.

A world and local view of the timber supply and the potentials for improvement in Maine through timber-stand improvement. Potentials for improvement are based on early results obtained from long-term silvicultural studies being conducted on the Penobscot Experimental Forest. Conditions related to reduction in cull trees, reduction in the mortality rate, and changes in species compositions are featured.

Frayer, W.E., and J.E. Barnard.

1974. **Experience with sampling with partial replacement in the United States.** *In* IUFRO Subject Group S4.02 June 1973 Meet. (Nancy, France) Proc. vol. 2. 7 p.

The background of Sampling with Partial Replacement (SPR) is described briefly. Experience data are presented from several areas of the United States, showing correlation coefficients for regression estimators of current volume. Other advantages of SPR are noted, and the completeness of the sampling system, including available ADP, is discussed.

Fulton, John R.

1974. **Pin cherry.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 26-28.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Furnival, George M., and Robert W. Wilson, Jr.

1974. **Regression by leaps and bounds.** Technometrics 16: 499-511, illus.

The authors describe several algorithms for computing the residual sums of squares for all possible regressions with what appears to be a minimum of arithmetic (less than six floating-point operations per regression) and show how two of these algorithms can be combined to form a simple leap-and-bound technique for finding the best subsets without examining all possible subsets. The result is a reduction of several orders of magnitude in the number of operations required to find the best subsets.

Gabriel, William J.

1974. **Phenotypic selection of sugar maples for superior sap volume production.** Northeast. For. Tree Improv. Conf. Proc. 21: 19-26, illus.

The program for selection of superior sap volume followed the basic concepts developed earlier in selecting for superior sap-sugar production in sugar maples. Selection work was scheduled for Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, Ohio, Michigan, and Wisconsin. Results of the first year of operation are presented. Seven states reported making 55 field selections from 2,375 trees tested in 38 different sugar-bushes. The program will be continued into the 1975-76 sugaring seasons.

Gabriel, William J.

1974. **A search for superior maples.** Natl. Maple Syrup Dig. 13: 16-17.

Locating superior sugar maple trees is the first step in the program for genetic improvement in sap production. The author asks sugarbush operators to report trees that they believe are superior sap producers.

*Galford, Jimmy R.

1974. **Some physiological effects of temperature on artificially reared red oak borers.** J. Econ. Entomol. 67: 709-710.

Enaphalodes rufulus (Haldeman) was artificially reared at 21.1, 26.7, and 32.2°C. Larvae reared at 21.1°C required about 50 days longer to develop than larvae reared at 26.7 or 32.2°C and were much smaller. Females reared at 21.1°C produced half as many eggs as females reared at 32.2°C. Most of the larvae entered diapause soon after reaching their maximum weight. A cold treatment was required to break diapause.

*Garrett, David

1974. **The energy crisis: what it means to you as a producer.** Natl. Maple Syrup Dig. 13(1): 12-16.

This study evaluated maple syrup processing costs and product price as affected by increased cost of No. 2 fuel oil. A price rise from 18 to 36 cents resulted in a 75-cent increase in costs of producing a gallon of syrup. Prices of maple syrup had to be increased 10 to 15 percent to compensate for increased costs. The results were used by

industry in establishing new price guidelines for 1975.

*Gatchell, Charles J., and Jarvis D. Michie.
1974. **Pendulum impact tests of wooden and steel highway guardrail posts.** USDA For. Serv. Res. Pap. NE-311. 20 p., illus.

Impact strength characteristics of southern pine, red oak, and steel highway guardrail posts were evaluated in destructive impact testing with a 4,000-pound pendulum at the Southwest Research Institute. Effects were recorded with high-speed motion-picture equipment. Comparisons were based on reactions to the point of major post failure. Major comparisons of 6x6-inch and 6x8-inch red oak and southern pine posts with W6x8.5 and S3x5.7 steel posts showed wooden posts to be equal or superior to steel. The basis for wooden-post specifications should be the amount of knot-associated grain distortion in the middle third of the tension face of the posts. Acceptable posts are those with no single knot in the middle third of the tension face that disorients the grain for more than one-third the width of the face.

*Gibson, Harry G., and Cleveland J. Biller.
1974. **Side-slope stability of logging tractors and forwarders.** Am. Soc. Agric. Eng. Trans. 17(2) : 245-250, illus.

Articulated-frame, four-wheel-drive, rubber-tired logging tractors were analyzed with a mathematical model for determining side-hill stability. A simulation method was used to translate tipping conditions into equations, and a computer program was developed for predicting static tipping angles.

Gibson, Lester P.
1974. **South American *Urosigalphus* (Hymenoptera: Braconidae).** Entomol. Soc. Am. Misc. Publ. 9(4) : 203-226.

This paper includes 23 species (20 new) from South America and 1 species (new) from Trinidad. Three subgenera are represented: *Bruchiurosigalphus* with 4 species, *Urosigalphus* with 5 species, and *Neourosigalphus* with 15 species. The known biology and distribution of each species are given, with complete descriptions. The species are internal parasites of Bruchidae and Curculionidae.

*Gill, John D., Richard M. DeGraaf, and Jack Ward Thomas.
1974. **Forest habitat management for nongame birds in central Appalachia.** USDA For. Serv. Res. Note NE-192. 6 p.

To woodland owners or managers who are interested in bird-habitat improvement, the authors suggest managing for: (1) people with slight to moderate knowledge of birds; (2) high numbers of both individual birds and bird species, particularly the conspicuous species; (3) seeing and hearing birds near trails and other human-activity areas; (4) bird nesting; and (5) natural-appearing habitat. The nesting-habitat preferences of 31 representative species are listed. Guidelines are offered for trails, sites, plants, growth stages, dimensions and lay-out, and treatments.

*Gill, John D., and William M. Healy.
1974. **Shrubs and vines for Northeastern wildlife.** USDA For. Serv. Gen. Tech. Rep. NE-9. 180 p., illus.

A non-technical handbook in which 34 authors discuss management of 97 native and 3 naturalized shrubs or woody vines most important to wildlife in the Northeast—Kentucky to Maryland to Newfoundland to Ontario. Topics include range, habitat, life history, uses, propagation, and management; but not identification. This handbook was produced in cooperation with the Northeastern Deer Study Group and its sponsor, the Association of Northeast Game, Fish, and Conservation Commissioners.

Gill, John D., and William M. Healy.
1974. **A handbook on shrubs and vines.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 1.

Introduction to the handbook, which was prepared to provide practical information about managing the shrubs and woody vines of the Northeast that are important to wild birds and mammals for food and protective cover.

Gill, John D., and Franz L. Pogge.
1974. ***ARONIA* Med.: Chokeberry.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 232-234, illus.

For three species of chokeberry, the authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination treatments, germination tests, and nursery practice.

Gill, John D., and Franz L. Pogge.
1974. *CHIONANTHUS VIRGINICUS* **L.: Fringetree.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 323-325, illus.

The authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination tests, and nursery practice.

Gill, John D., and Franz L. Pogge.
1974. *PYRUS* **L.: Pear.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 689-691, illus.

For two species of pears, the authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination tests, and nursery practice.

Gill, John D., and Franz L. Pogge.
1974. *PHYSOCARPUS* **Maxim.: Ninebark.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 584-586, illus.

For two species of ninebark, the authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination tests, and nursery practice.

Gill, John D., and Franz L. Pogge.
1974. *PARTHENOCISSUS* **Planch.: Creeper.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 568-571, illus.

For three species of creepers, the authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination tests, and nursery practice.

Gill, John D., and Franz L. Pogge.
1974. *CYTISUS SCOPARIUS* **(L.) Lk.: Scotch broom.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 370-371, illus.

The authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination tests, and nursery practice.

Gill, John D., and Franz L. Pogge.
1974. *ROSA* **L.: Rose.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 732-737, illus.

For ten species of roses, the authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination tests, and nursery practice.

Gill, John D., and Franz L. Pogge.
1974. *VIBURNUM* **L.: Viburnum.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 844-850, illus.

For ten species of viburnums, the authors discuss and describe growth habit, occurrence, use, flowering and fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, germination tests, and nursery practice.

Gill, John D., and David P. Worley.
1974. **Inventory for managing timber and wildlife habitat.** Timber-Wildl. Manag. Symp. Proc. Univ. Mo. Occas. Pap. 3: 26-32.

Managing timber and wildlife habitat requires inventories to match ownership objectives with land capabilities, selection management alternatives, and evaluate the management. For small privately owned properties, requirements of such inventories are discussed, and a two-stage system is proposed. The first phase screens out unnecessary measurements and saves time and money in the second, more technical phase.

Gove, J.P., and M.C. Hoyle.
1974. **Peroxidase isoenzymes of yellow birch and horseradish.** Am. Soc. Plant Physiol. Annu. Meet. Abstr. 230: 41. Cornell Univ.

The dual catalytic ability of peroxidase isozymes to catalyze oxidation of indoleacetic acid was examined after separation by isoelectric focusing in polyacrylamide gels. All isozymes showed dual catalysis, and highest activity (both types) was found on isozymes with highest isoelectric points.

Gregory, Garold F., and Thomas W. Jones.
1974. **Protection of sand-grown red oak seedlings from oak wilt disease by drenching with benomyl.** USDA Plant Dis. Rep. 58(1) : 65-67.
Treatment of sand-grown red oak seedlings with aqueous suspensions of benomyl resulted in accumulation of fungitoxicant in the stems and leaves and in the prevention of the oak wilt disease.

Grisez, Ted. J.
1974. *PRUNUS* **L.: Cherry, peach, and plum.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 658-673, illus.
New information on species included in the 1948 Woody Plant Seed Manual and several additional species. Seed characteristics, storage, stratification, and germination methods and nursery practices for 24 species are described. Seeds of many species of cherries and plums will germinate well if cleaned promptly after collection, surface-dried only, and sown early in fall or stratified 90 to 150 days before spring sowing.

Hacskaylo, E., and C.M. Tompkins.
1973. **World literature on mycorrhizae.** Reed Herb. Contrib. 22. 142 p.
About 3,000 references to works dealing with mycorrhizae in forestry, legumes, orchids, crops, and ornamentals.

Hamilton, Tom S., Jr.
1974. **Eastern hophornbeam.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 83-85.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Hamilton, Tom S., Jr.
1974. **Sassafras.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 122-125.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

*Hay, C. John.
1974. **Timber beetle defect in black oak in western North Carolina.** South. Lumberman 228 (2826) : 9-10.
A new host, *Quercus velutina,* is specified for the Columbian timber beetle, *Corthylus columbianus.* Factory-grade logs cut from 45 black oak trees on a cove site were examined in a mill study. Beetle defect occurred in lumber from 29 percent of the trees sampled. However, less than 2 percent of the lumber was actually degraded. The loss to this insect was $0.35 per M board feet of lumber sawn. The Damage impact is greatest in the butt and second logs grading as ones or twos.

Hay, C. John.
1974. **Survival and mortality of red oak borer larvae on black, scarlet, and northern red oak in eastern Kentucky.** Entomol. Soc. Am. Ann. 67(6) : 981-986.
Survival and mortality of three generations of the red oak borer, *Enaphalodes rufulus* (Haldeman), were studied over a 7-year period. The borers showed a preference for black oak over red and scarlet oaks. Larval mortality was about the same on all hosts. Tree vigor and size did not affect larval mortality; however, both factors did influence attack density. Larval mortality was 40 percent in the early instars, primarily because of woodpecker predation.

Healy, William M.
1974. **Wild turkey traits.** Turkey Call 2 (1) : 17-24.
A general description of the behavior of human-imprinted wild turkeys from hatching to maturity. The technique of using imprinted birds to evaluate habitat is described, and the relationships between poult behavior and food and cover are discussed.

Healy, William M., and John D. Gill.
1974. **Alders.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 6-9.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Healy, William M., and Sadie L. Robinette.

1974. **Huckleberries.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 89-92.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

*Heisler, Gordon M.

1974. **Trees and human comfort in urban areas.** J. For. 72: 466-469, illus.

The most important contribution of trees to amelioration of urban microclimate is in interception of solar radiation. Shielding of long-wave radiation by trees has usually been underemphasized. Transpiration by trees may be important in urban energy budgets, but the total effect of transpiration by city trees is not well understood. Use of trees for control of air flow requires care because in summer increased wind speed is desired, but in winter trees can greatly increase human comfort by reducing wind speed. Metabolism and photosynthesis by trees have no significant impact on microclimate.

Hejnowicz, Zygmunt.

1974. **Pulsations of domain length as support for the hypothesis of morphogenetic waves in the cambium.** Acta Soc. Bot. Pol. 43: 261-271.

The existence of orientational domains in the cambia of trees is complicated by the slow migration and pulsation of the domain pattern. A unifying hypothesis, invoking morphogenic waves, is offered here: the domain pattern itself represents the spatial aspect of the wave. The reversals of domain type at a particular site represent the time aspect. The pulsations are due to superposition of waves of different length and velocity. The hypothesis can be tested by detailed study of the microanatomy of samples of wood that have wavy or interlocked grain patterns.

Hejnowicz, Z.

1973. **Morphogenetic waves in the cambia of trees.** Plant Sci. Lett. 1: 359-366.

The migrating domain patterns of cambia can be interpreted as morphogenic wave phenomena. The waves are slow, moving only a few millimeters or centimeters per year. The period is about 10 years. Waves of two or more wavelengths can coexist in the same cambium. The interference of such waves produces a stationary pattern of beats. These concepts have been incorporated into a working hypothesis linking morphogenic waves with spatial organization in developing plants.

Hejnowicz, Z., and B. Zagórska-Marek.

1974. **Mechanism of changes in grain inclination in wood produced by storeyed cambium.** Acta Soc. Bot. Pol. 43: 381-398.

Wood having interlocked grain is not limited to species having non-storied cambia and extensive intrusive growth of fusiform elements; it occurs in species with storied cambia also. The question of the cellular mechanism of change in grain orientation in storied cambia was investigated by anatomical study of *Tilia* and *Entandrophragma* wood. Evidentally the very limited intrusive growth of axial elements in storied cambia is adequate to allow the observed changes in cell orientation.

Holweg, Arthur W.

1974. **Common winterberry.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 150-153.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Hornbeck, James W., C. Anthony Federer, and Robert S. Pierce.

1974. **Managing New Hampshire forests for water.** N.H. Water Works Assoc. 35 (4): 7-18.

The relationships between forests and streamflow in New Hampshire are discussed, and some possibilities are given for managing forests to improve and protect water supplies.

*Hornbeck, James W., and Gene E. Likens.

1974. **The ecosystem concept for determining the importance of chemical composition of snow.** Natl. Acad. Sci. Interdisciplinary Symp. on Adv. Concepts and Tech. in Study of Snow and Ice Resour. Proc.: 139-151.

The importance of the snow pack was evaluated in relation to chemical inputs to a forest ecosystem and to chemical outputs in

streamflow. Just before spring melt the snowpack contained about 50 percent of the total calcium and 25 percent of the total nitrate and sulfate input to the ecosystem in winter precipitation. Postassium in the snowpack just before melt was nearly twice the amount of input by winter precipitation. For all four ions the amount stored in the snowpack was small in relation to the amount lost in streamflow.

Hornbeck, James W., and Gene E. Likens.

1974. **Importance of the chemical composition of the snowpack.** East. Snow Conf. Annu. Proc. 31: 145-155. Ottawa.

The chemical composition of the snowpack was determined throughout the winter of 1972-73 in the Hubbard Brook Experimental Forest, New Hampshire. The snowpack was slightly less acid and had about the same or lower concentrations of calcium, nitrate, and sulfate than incident precipitation. The amount of nutrients stored in the snowpack was generally small in relation to the amount lost from the ecosystem in streamflow.

Hosier, Paul E.

1974. **Maples.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 93-95.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Hosier, Paul E.

1974. **Striped maple.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 96-97.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Houston, David R.

1974. **Diebacks and declines: diseases initiated by stress, including defoliation.** Arborists News 49: 73-76. [Reprinted from Int. Shade Tree Conf. Proc. 49: 73-76. 1973.]

The results of recent studies by the author and his colleagues on the physiology and ecology of maple and oak declines, and some implications and potential uses of these results are presented.

Houston, David R.

1974. **Basal canker disease of white pine: ecological comparison between disease development in New York and Maine.** (Abstr.) Phytopathology 64(5): 582.

Basal canker on white pines planted along Route I-95 in central Maine was noted in 1972. Study revealed marked ecological similarities between this situation and that on Tug Hill in north-central New York. In both places, young trees injured by ants, *Formica fusca,* or by snow or ice were invaded by canker fungi; and damage was associated with site features that influenced occurrence of ant mounds or accumulation of ice and snow. Greenhouse inoculation trials confirmed pathogenicity of several fungal isolates, including a *Fusarium* sp.

Hoyle, M.C., E.R. Hager, and J.P. Gove.

1974. **Problems in total extraction of IAA oxidase from birch leaves.** Third North Am. For. Biol. Workshop Proc.: 361 Colo. State Univ.

Complete extraction of soluble IAA oxidase from birch leaves was examined by use of numerous factors. Sulfhydryl reagents, chelators, and dialysis were not effective. Total extraction was achieved with pH 6 buffer, 0.2% detergent (Triton X-100), and 60% phenol scavenger (polyvinylpyrollidone), with optimal extraction times and tissue buffer ratios.

*Huyler, Neil K.

1974. **Live-sawing: a way to increase lumber grade yield and mill profits.** USDA For. Serv. Res. Pap. NE-305. 9 p., illus.

A study to compare live-sawing with conventional grade-sawing of factory-grade 3 red oak sawlogs revealed that live-sawing results in substantial increases in production rate, overrun, log value per thousand board feet, and significant reduction in size of the break-even log diameter.

Jackson, Lawrence W.

1974. **Honeysuckles.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 71-82.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Jensen, Keith F.

1974. **Absorption, translocation, and soil deposition of aerial pollutants by vegetation.** Soil Conserv. Soc. Am. Annu. Proc. 28: 26-29.

Vegetation reduces atmospheric levels of a wide range of pollutants, including sulfur dioxide, ammonia, fluorides, and many heavy metals. Information on the absorption of pollutants, their translocation through the plant system, and subsequent deposition in the soil is vital to our understanding of air-pollution effects on food chains, plant growth and productivity, and soil toxicity.

*Jensen, Keith F., and Leon S. Dochinger.

1974. **Responses of hybrid poplar cuttings to chronic and acute levels of ozone.** Environ. Pollut. 6: 289-295, illus.

Hybrid poplar cuttings were exposed to either 0-15 ppm ozone for 6 weeks or 1 ppm ozone for 2, 4, or 8 hours. The chronic ozone treatment reduced growth by 50 percent and caused injury to 75 percent of the leaves. The acute ozone treatment had no effect on growth but caused injury to 70 percent of leaves 48 hours after fumigation.

Jensen, K.F., and T.T. Kozlowski.

1974. **Sulfur dioxide absorption and translocation in forest tree seedlings.** (Abstr.) Am. J. Bot. 61(5): 28.

One-year-old seedlings of *Acer saccharum, Populus grandidentata, Fraxinus americana,* and *Betula alleghaniensis* were fumigated with sulfur dioxide (SO_2). SO_2 absorption rates were measured for seedlings that had been prefumigated with 0.75 ppm SO_2 for up to 34 hours. With no prefumigation, *Populus grandidentata* had the highest absorption rate and *Acer saccharum* the lowest. Translocation of absorbed sulfur was measured with $^{35}SO_2$. For the first 4 days after fumigation, most of the radioactive sulfur was found in leaves, but by the eighth day large amounts were also found in the roots.

Jensen, K.F., and T.T. Kozlowski.

1974. **Effect of SO_2 on photosynthesis of quaking aspen and white ash seedlings.** (Abstr.) Third North Am. For. Biol. Workshop Proc.: 359.

Rates of photosynthesis of quaking aspen and white ash seedlings were measured before and after fumigation for 2 or 4 hours with 0.2, 0.5, 1.0, or 4.0 ppm SO^2. No marked change in rate was recorded after fumigation at 0.2 or 0.5 ppm, but 1 ppm caused a slight reduction in photosynthesis and 4 ppm caused a large decrease. Within 24 hours photosynthesis of all seedlings had partially or completely recovered.

*Johnson, Leonard R., Cleveland J. Biller.

1974. **Wood-chipping and a balanced logging system simulation can check the combinations.** Am. Soc. Agric. Engin. Trans. 17(4): 651-655, illus.

The best cost picture will result when the production capabilities of fellers, skidders, and trucks working with a chipper are matched with the chipper's capability. SAPLOS (Simulation APplied to LOgging Systems), a simulation model, was used to test various combinations of men and equipment for a logging site.

*Keiser, George M.

1974. **A guide to collecting and preserving plants.** USDA For. Serv. Res. Note NE-188. 6 p., illus.

Directions for collecting and preserving plant specimens. Plant pressing, mounting, and labeling techniques are described.

Kennedy, Bruce H.

1974. **Net reproduction of *Dendrosoter protuberans* (Nees), *Spathius benefactor* Matthews and *Cheiropachus colon* (L.) reared on larvae of *Scolytus multistriatus* (Marsham).** Entomol. Soc. Am. North Cent. Branch Annu. Meet. 29: 178-179. Des Moines, Iowa.

Studies were conducted to determine the net reproduction of *Dendrosoter protuberans* (Nees), a braconid recently introduced from France; *Spathius benefactor* Matthews, a native braconid; and *Cheiropachus colon* (L.), a pteromalid—all of which can parasitize late-instar larvae of *Scolytus multistriatus* (Marsham). Under laboratory conditions, *D. protuberans* averaged 11 progeny per pair, and *S. benefactor* averaged 6 per pair. Under field conditions, *D. protuberans* averaged 10 per pair and *S. benefactor* averaged 6. *C. colon* produced an average of 27 progeny per pair.

Kennedy, Bruce H., and Nick H. Roberto.

1974. *Dendrosoter protuberans* **(Nees) an introduced parasite of** *Scolytus multistriatus* **(Marsham) is established in Detroit, Michigan.** Entomol. Soc. Am. North Cent. Branch Annu. Meet. 29: 177-178. Des Moines, Iowa.

Dendrosoter protuberans (Nees), a braconid introduced from France, and a parasite of *Scolytus multistriatus* (Marsham), has become established in Detroit, Michigan. Releases were made in 1968 at River Rouge Park and in the suburbs of Bloomfield Hills and Warren, Michigan, in 1969. Individuals were recovered from beetle-infested elm wood taken from River Rouge Park in the winter and summer of 1972 and from wire mesh traps attached to beetle-infested trees in River Rouge Park in the summer of 1972. In 1973, *D. protuberans* was collected from beetle-infested elms in other areas of Detroit and suburbs.

*Kingsley, Neal P.

1974. **The timber resources of Southern New England.** USDA For. Serv. Resour. Bull. NE-36. 50 p., illus.

A statistical and analytical report on the second forest survey of Connecticut, Rhode Island, and Massachusetts. Statistical findings are based on the remeasurement of 1/5-acre plots and new 10-point cluster plots. Trends in forest-land area, timber volume, annual growth, and timber removals are analyzed. Timber-products output by forest industries, based upon a canvass of industries in 1971, and the importance of timber and forests to the region's economy and environment, are also discussed. The report includes a discussion of the outlook for timber supplies during the next 30 years and forest-management opportunities in the region.

Konar, R.N.

1974. **In vitro studies on** *Pinus*. **I. Establishment and growth of callus.** Physiol. Plant. 32: 193-197.

Tissue from *Pinus gerardiana* hypocotyls was established in sterile culture. The nutrient medium was supplemented with sucrose, coconut milk, casein hydrolysate, and 2,4-D. Glutamine could be substituted for casein hydrolysate. Work is in progress toward inducing differentiation of root and shoot meristems in the callus. The ultimate goal is to reproduce large numbers of plantlets from cultured cells or tissues of desirable clones.

Kopcewicz, J., and Z. Porazinski.

1973. **Influence of low temperature on germination and endogenous growth regulator contents in Scots Pine (***Pinus silvestris* **L.) seeds.** Acta Soc. Bot. Pol. 42: 233-240.

After 20 days of cold stratification, Scotch pine seeds germinate equally well in light or darkness. The light requirement is overcome because there is an increase in gibberellin content of the seeds during stratification. New groups of gibberellins become detectable. Seedlings grown from stratified pine seeds also contain increased amounts of gibberellins.

Krawczyszyn, J.

1973. **Domain pattern in the cambium of young** *Platanus* **stems.** Acta Soc. Bot. Pol. 42: 637-648.

During the first year of growth of *Platanus* stems the cambium can already be delineated into domains on the basis of local prevalences of right or left orientations of certain cell divisions. The pattern that appears when these domains are mapped is related to the position of nodes and leaves. As the cambium forms additional annual rings, the domain pattern changes and is probably highly significant in establishing the interlocked grain pattern characteristic of *Platanus* wood.

Kriesel, K., and M. Michniewicz.

1974. **The mutual influence of roots and shoots on gibberellin production.** Bull. Acad. Pol. Sci. Ser. Biol. 22: 507-512.

The type and amount of free and bound gibberellins in shoots and adventitious roots of willow was studied. The data were interpreted as follows: shoots influence the type and amount of gibberellins formed in roots, and vice versa. These results support earlier statements suggesting that both shoots and adventitious roots of willow are sites of gibberellin biosynthesis.

Krochmal, Arnold.

1974. **Some common diseases of papaya.** *CEIBA* 18(1-2): 19-31, illus. (Escuela Agricola Panamericana, Tegucigalpa.)

Papaya, which is gaining importance as a crop because of its excellent flavor and high vitamin-C content, is affected by three fungus diseases (anthracnose, St. Croix decline, and phytophthora) and two virus diseases (mosaic and bunchy top). The symptoms and effects of these diseases are described.

*Krochmal, Arnold, Leon Wilkins, David Van Lear, and Millie Chien.

1974. **Mayapple.** USDA For. Serv. Res. Pap. NE-296. 8 p., illus.

The mayapple (*Podophyllum peltatum* L.), long used in folk medicine, was studied to gain more information about its characteristics and potentialities. The plant and its distribution, site soils, and botany are described. Efforts to germinate seed were unsuccessful. Some notes on chemical properties and biological action.

Krugman, S.L., W.I. Stein, and D.M. Schmitt.

1974. **Seed biology.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 5-40.

The introductory chapter to this seed manual. Seed is the principal means for perpetuation of most trees and many other woody species from one generation to the next. The life of a seed is a complex series of biological events beginning with the flower and ending with germination of the mature seed.

Lancaster, Kenneth F., and Russell S. Walters.

1974. **How to hang plastic tubing to collect maple sap.** USDA For. Serv. Northeast. Area State & Priv. For. 6 p., illus.

A brochure folder showing how to install a plastic tubing system for collecting maple sap. Common errors to avoid are illustrated, including crimping or kinking of lines, leaks at junction points, and sagging lines.

*Lancaster, Kenneth F., Russell S. Walters, Frederick M. Laing, and Raymond T. Foulds.

1974. **A silvicultural guide for developing a sugarbush.** USDA For. Serv. Res. Pap. NE-286. 11 p., illus.

Guidelines for the manipulation of stand density and stocking to promote development of healthy, vigorous trees with deep, wide crowns, the necessary attributes for highest possible yield of sugar-rich sap. Specific treatments are prescribed for sapling, pole-timber, and small sawtimber stands, and a method of selection for thinning is described.

LaPage, Wilbur F.

1974. **Market research—the missing link in resource-development planning for outdoor recreation.** *In* Outdoor recreation research: applying the results. USDA For. Serv. Gen. Tech. Rep. NC-9: 107-113.

The development of progressive models of outdoor recreation markets is described, with emphasis on research findings from the family camping market. An introductory stages-of-growth model is presented in stages: infancy, adolescence, young adulthood, and maturity. From this, a more complete model of camping-market expansion is developed, which details the sizes of and relationships among various segments of the camping market.

*LaPage, W. F., and A. C. Haaland.

1974. **Annotated bibliography of camping market surveys.** USDA For. Serv. Gen. Tech. Rep. NE-11. 39 p.

A compendium of more than 200 published and unpublished surveys and observational studies of campers conducted between 1936 and 1973. The majority of citations are American and Canadian. The bibliography is organized in five categories: national, regional, local, readership, and miscellaneous.

*LaPage, W.F., and D.P. Ragain.

1974. **Family camping trends—an eight-year panel study.** J. Leisure Res. 6: 101-112.

Eight years of annual camping-participation data, reported by a panel of 459 camping families, revealed that 51 percent of the campers were either camping less or had dropped out of camping. One out of every four families had increased its camping participation from an average of 22 days per year in 1964-68 to 36 days in 1969-71. Campers with increasing or decreasing trends were more likely to have experienced a

change in their style of camping than were those families with a constant or highly variable pattern of participation.

*Large, Hollis R., and Richard E. Frost.
1974. **Quality distribution of pallet parts from low-grade lumber.** USDA For. Serv. Res. Pap. NE-284. 8 p., illus.
To produce better pallets, the higher quality parts should be used in the more vulnerable positions in the pallet. To determine the feasibility of doing this, pallet parts cut from commonly used lumber mixes were graded into four quality levels. The distributions obtained indicate that sufficient numbers of high-quality parts can be cut from existing raw material to allow selective placement. Four species groups—eastern hardwood, southern pine, Douglas-fir, and a small amount of western hardwood—were included in the study.

Larson, Joseph S.
1974. **Serviceberries.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 126-128.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Leaf, Albert L., and R.E. Leonard.
1974. **Fertilization in an environmental context.** South. Lumberman 229(2848): 88.
Forest fertilization triggers a host of complex interrelated events within the ecosystem. These events pose (1) potential pollution hazards and (2) potential ecological side effects, including the effects of the initial energy changes on the ecosystem, secondary changes resulting from the initial changes, and societal effects resulting from ecosystem changes. Large-scale fertilization operations may also have an effect on socioeconomic conditions in a region.

Leak, William B.
1974. **Elevation v. tree development.** N.H. For. Notes 119: 24-25, illus.
The relationship of tree development to elevation is basic to the elevational zoning of forest land for a variety of possible uses. Data from a transect on Mt. Whiteface in New Hampshire, coupled with comparative information from other New England sources, indicates that tree/forest development begins to decline appreciably at about ¾ the distance up the mountain range or between 3,000 and 3,300 feet elevation, whichever criterion comes first.

Leak, W.B.
1974. **Review of Systems analysis and simulation in ecology.** Ecology 55(3): 678-679.
A descriptive review of the second volume of "Systems analysis and simulation in ecology," edited by B. Patten.

*Leak, William B.
1974. **Some effects of forest preservation.** USDA For. Serv. Res. Note NE-186. 4 p., illus.
Long-term preservation (no cutting) of a deciduous forest stand in New Hampshire is leading toward stable populations of beech, sugar maple, striped maple, mountain maple, and hobblebush, coupled with a decline or complete disappearance of other woody species. The humus has stabilized at a depth no greater than that of cut stands. Nitrate discharge in the streams is higher than what is normally found in uncut stands, possibly because of stability in standing crop and humus.

Leak, W.B., and R.E. Graber.
1974. **A method for detecting migration of forest vegetation.** Ecology 55: 1425-1427, illus.
A theoretical method is described for detecting and estimating the rate of tree- and shrub-species migration based upon measurements of maximum and minimum age along a transect. Age data from Mt. Washington indicate that the method does detect migrational trends under field conditions, although appreciable variation is encountered.

*Leak, William B., and Raymond E. Graber.
1974. **Forest vegetation related to elevation in the White Mountains of New Hampshire.** USDA For. Serv. Res. Pap. NE-299. 7 p., illus.
Maximum tree size and species composition are related to elevation on Mount Washington (disturbed by logging) and Mount Whiteface (uncut) in the White Mountains of New Hampshire. Species migration trends and differences between the two mountains

in species elevation limits indicate that both hardwoods and softwoods will move to higher elevations in areas where cutting and heavy disturbance are eliminated.

Lesser, Walter A., and Jean D. Wistendahl.
1974. **Dogwoods.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 32-41.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

*Lewis, F.B., N.R. Dubois, D. Grimble, W. Metterhouse, and J. Quimby.
1974. **Gypsy moth: efficacy of aerially-applied** ***Bacillus thuringiensis.*** J. Econ. Entomol. 351-354.
Eight billion International Units of Dipel® and Thuricide® were applied aerially in New Jersey, New York, and Pennsylvania against *Porthetria dispar* (L). Two gallons of finished spray per acre were applied twice about 10 days apart. Foliage protection was achieved in most cases, but desired population reduction was not achieved. Very rainy cool weather contributed heavily to the results of this experiment.

Liscinsky, Stephen A.
1974. **Gray dogwood.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 42-43.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

*Little, Silas.
1974. **Wildflowers of the pine barrens and their niche requirements.** N. J. Outdoors 1 (3): 17-18, illus.
The New Jersey pine barrens have long attracted botanists and other people interested in rare plants. Many of these plants have niches determined by soil, moisture, amount of overhead light, and sometimes type of forest floor. Certain kinds of disturbances—as fire, timber cutting, mining, construction, and abandonment of logging roads—are needed to provide the conditions these plants require.

Little, Silas.
1974. **Effects of fire on temperate forests: northeastern United States.** *In* Fires and ecosystems: 225-250, illus. Academic Press, New York.
The frequency and type of presettlement fires and postsettlement fires have had major effects on the composition of vegetation in the Northeast. Varying fire history can cause great changes in the forest composition on specific sites, and different species are adapted to different fire regimes. Fire effects are described by types: spruce-fir, northern hardwoods, eastern white pine, oaks, yellow-poplar and sweetgum, pitch pine, Atlantic white-cedar, Virginia pine, and loblolly and pond pines.

Little, Silas.
1974. *AILANTHUS ALTISSIMA* **(Mill.) Swingle: Ailanthus.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 201-202, illus.
Flowering, fruiting, collection of fruits, extraction and storage of seeds, pregermination treatments, and procedures in germination tests and in the nursery are briefly described.

Little, Silas.
1974. **Review of Vegetation of New Jersey.** Torrey Bot. Club Bull. 101(1): 36.
This book is a valuable guide to all persons interested in the broad vegetational types of New Jersey and the factors causing the different types. The book is weakened by its broad-brush treatment of most topics, incomplete literature citations, a few factual errors, and—in the reviewer's opinion—misinterpretation of some successional relationships.

*Little, Silas, Calvin F. Bey, and Daniel McConaughy.
1974. **Local sources of black walnut recommended for planting in Maryland.** USDA For. Serv. Res. Note NE-185. 3 p.
After 5 years, local black walnut seedlings in a Maryland planting were taller than those of 12 out-of-state sources. Seedlings from south-of-local sources outgrew trees from northern sources. Genetic influence on height was expressed early — with little change in ranking of sources after the third year.

MacConnell, William P., and Marcia Cobb.
1974. **Remote sensing 20 years of change in Middlesex County, Massachusetts, 1951-1971.** Mass. Agric. Exp. Stn. Res. Bull. 622. 159 p.

A report on changes in land-use and vegetative types based on interpretation of 1951 and 1971 aerial photographs. Land was classified to a 5-acre minimum in one of six broad types: (1) agricultural or open land, (2) forest land, (3) fresh and salt water wetlands, (4) mining and waste-disposal areas, (5) urban lands, and (6) outdoor recreation facilities. Classification was further subdivided into 104 types. Maps may be ordered to accompany the report.

MacConnell, William P., W. Cunningham, and R. Blanchard.
1974. **Remote sensing 20 years of change in Essex County, Massachusetts, 1951-1971.** Univ. Mass. Coop. Ext. Serv. Publ. 98. 104 p.

See above.

MacConnell, William P., and William Niedzwiedz.
1974. **Remote sensing 20 years of change in Worcester County, Massachusetts, 1951-1971.** Mass. Agric. Exp. Stn. Res. Bull. 625. 173 p.

See above.

MacConnell, William P., H. Ross Pywell, and Peter E. Young.
1974. **Remote sensing 20 years of change in Suffolk and Norfolk Counties, Massachusetts, 1951-1971.** Mass. Agric. Exp. Stn. Res. Bull. 624. 112 p.

See above.

MacConnell, William P., Nancy Arny Pywell, Dana Robertson, and William Niedzwiedz.
1974. **Remote sensing 20 years of change in Barnstable, Dukes, and Nantucket Counties, Massachusetts, 1951-1971.** Mass. Agric. Exp. Stn. Res. Bull. 623. 112 p.

See above.

McGinnes, E.A., Jr., J.E. Phelps, and J.C. Ward.
1974. **Ultra-structure observations of tangential shake formations in hardwoods.** Wood Sci. 6(3): 206-211.

Tangential shake formation in a tree is a highly complex process. In this study a scanning electron microscope and transmission electron microscope were used to explore the wood structure and abnormalities associated with the shake zones in several hardwoods. Results of previous studies were verified, and the desirability of more work on lignin properties and bacteria associations in the shake zones was emphasized.

McGinnes, E.A., Jr., and A.L. Shigo.
1974. **An aid for detection of discoloration and decay in standing trees.** (Abstr.) For. Prod. Res. Soc. 28th. Annu. Meet. Abstr.: 4.

A new approach to the detection of decay or discoloration in its initial stages in standing trees uses an electric current to measure the mobile ion concentration profile within the tree. After a small hole 8-10 inches deep is drilled into the tree, a wire probe is inserted and a pulsed electric current is passed through the wood tissue surrounding the tip of the probe. The changing pattern of resistance readings made at selected intervals from bark to tree interior indicates areas of sound wood, initiation of decay or discoloration, or decayed wood.

*Marquis, David A.
1974. **The impact of deer browsing on Allegheny hardwood regeneration.** USDA For. Serv. Res. Pap. NE-308. 8 p., illus.

To evaluate the impact of deer browsing on Allegheny hardwood regeneration, surveys of vegetation were made inside and outside deer exclosures in 13 stands that had been clearcut 5 to 16 years earlier. The surveys showed that browsing by white-tailed deer has resulted in regeneration failures in 25 to 40 percent of the areas studied. Pin cherry and sugar maple were the species most severely reduced by browsing, while beech, birch, and striped maple increased in proportion to other species in areas subjected to deer.

Martell, Arthur M.
1974. **Canada yew.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 158-160.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Michalski, Leszek.

1974. **Content of plant growth regulators in the developing seeds of oak (*Quercus robur* L.). III. Kinetin-like substances.** Acta Soc. Bot. Pol. 43: 307-312.

Changes in the complement of kinetin-like substances in developing acorns were studied. Active cell-division-promoting substances can be detected at various stages of seed development. In the course of seed maturation there is a decline in the content of activity of such substances.

Michniewicz, M., and E. Galoch.

1974. **The role of vanillin and p-coumaric acid in the growth of Scotch pine seedlings.** Acta Soc. Bot. Pol. 43: 273-281.

Low concentrations of vanillin and p-coumaric acid stimulate the growth of pine seedlings. The most effective concentration is 10^{-7} M. In young seedlings there is an effect upon both elongation and fresh and dry weight; later only a weight effect is evident. Growth stimulation in treated plants was accompanied by an increase in auxin and a decrease in free gibberellins. No effects upon abscisin-like inhibitors could be detected.

Michniewicz, M., E. Galoch, B. Rozej, and Z. Zatorska.

1974. **Dynamics of endogenous plant growth regulators in the early stages of growth and development of Scotch pine seedlings (*Pinus silvestris* L.).** Bull. Acad. Pol. Sci. Ser. Biol. 22: 625-631.

The growth rate of pine seedlings is typically high during the first 7-8 days after germination. This intensive growth is correlated with high levels of free gibberellins and low levels of abscisin-like inhibitors. Decreasing growth after 10 days is correlated with increasing inhibitor content. No correlation could be established between activity of auxins and cytokinins in the shoots and the rate of growth. The rate of leaf primordium initiation is correlated with auxin level in the roots.

Moeller, G.H., and H.E. Echelberger.

1974. **Approaches to forecasting recreation consumption.** *In* Outdoor recreation research: applying the results. [Marquette, Mich., Workshop Proc.] USDA For. Serv. Gen. Tech. Rep. NC-9: 43-55.

Approaches to forecasting consumption of resource-based outdoor recreation are summarized. Although the discussion is oriented toward the quantity of recreation that will be consumed, qualitative aspects of recreation experiences and environments are also discussed. Forecasting models are evaluated in terms of suitability for recreation planning and accuracy of results.

*Moeller, G.H., and J.H. Engelken.

1974. **What fishermen look for in a fishing experience.** Trout 5(4): 28, 43-44. [Reprinted from J. Wildl. Manage. 36: 1254-1257, 1972.]

One hundred fishermen in central New York State were interviewed to determine the relative importance of eight selected factors that influence the success of a typical 1-day fishing trip. Elements of the natural environment—water quality, natural beauty, and privacy—were consistently rated as most important. Size and number of fish caught, weather conditions, and access to fishing waters were rated moderate. Facilities available were given low ratings.

*Moeller, George H., Rodney G. Larson, Douglas A. Morrison.

1974. **Opinions of campers and boaters at the Allegheny reservoir.** USDA For. Serv. Res. Pap. NE-307. 26 p., illus.

Interviews with 157 campers and 281 boaters near the Allegheny Reservoir on the Allegheny National Forest revealed that their perceptions of management problems differed from those of managers. Different users had different attitudes toward recreation use controls, fee policies, recreation zoning, law enforcement, and facility development needs. This diversity indicates that changes in recreation management policy will not affect all recreation users equally; their impact will depend on how active the users are, the number of activities they participate in, and how familiar they are with the area.

*Moeller, George H., Robert MacLachlan, and Douglass A. Morrison.

1974. **Measuring perception of elements in outdoor environments.** USDA For. Serv. Res. Pap. NE-289. 9 p., illus.

The meanings of 10 general concepts that describe elements of natural outdoor environments and experiences were measured with the semantic differential technique. Each element or concept was evaluated in terms of semantic scores on three factors of meaning—evaluation, potency, and activity. A total of 180 recreationists were surveyed —60 from each of three recreation groups. Similarities and differences were found among the three groups—campers, picnickers, and wilderness hikers—in the ways in which they perceived each other and elements of recreation environments. Although they are tentative, study results should contribute toward a better understanding of the way in which people relate to outdoor environments and what they expect from those environments.

*Nevel, Robert L., Jr.
1974. **Use of hardwood flooring in urban rehabilitation.** For. Prod. J. 25(1): 13-16.
Although one of the major wood products used in urban rehabilitation is hardwood flooring, the use of hardwood flooring in new or renovated housing is decreasing relative to other flooring materials. The most important factors limiting use of hardwood flooring are related to product availability, cost to the building contractor, efficiency of installation, and compatibility with construction practices. To lessen the effect of these factors, the author recommends a well-rounded marketing and distribution program and basic changes in product design and installation techniques.

*Nevel, Robert L., Jr.
1974. **Recommended action for the wood-flooring industry to secure its share of the urban rehabilitation market.** USDA For. Serv. Res. Pap. NE-287. 5 p.
Urban rehabilitation is a major market for wood flooring, but wood flooring must be made more acceptable to the building contractor and housing owner. Changes in distribution, supply, and pricing could make wood flooring more readily available; product modification could reduce its short-term costs; and other changes could make wood flooring more economical and compatible with present working methods.

Nixon, Charles M., and D. Michael Worley.
1974. **Partridgeberry.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 111-112.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Northeastern Forest Experiment Station.
1974. **1973 at the Northeastern Station.** USDA For. Serv. Northeast. For. Exp. Stn., Upper Darby, Pa. 59 p., illus.
A summary of research activities and accomplishments in timber management, forest insects and diseases, forest economics, watershed management, forest products utilization, forest survey, forest recreation, environmental forestry research, wildlife habitat, forest engineering, and forest products marketing. Annotated list of publications.

*Northeastern Forest Experiment Station.
1974. **Forestry Sciences Laboratory, Warren, Pennsylvania.** USDA For. Serv. Northeast. For. Exp. Stn. 4 p. plus inserts.
A pocket brochure describing research at the Station's laboratory at Warren, Pa. Inserted folders contain details about the laboratory and its facilities, and about the research programs in timber management and wildlife-habitat management.

*Northeastern Forest Experiment Station.
1974. **To heal the scars.** USDA For. Serv. Northeast. For. Exp. Stn. 16 p., illus.
A two-color brochure on strip-mine reclamation research at Berea, Ky., describing the processes and problems associated with surface mining in the Appalachians and the tools and methods that researchers use to reclaim damaged land.

*Northeastern Forest Experiment Station.
1974. **Northeastern Forest Experiment Station.** USDA For. Serv. Northeast. For. Exp. Stn. 12 p., illus.
A booklet describing research at the Northeastern Station. The laboratories are listed alphabetically and short summaries are given of the work of each research unit. A map of the Station is included.

*Northeastern Forest Experiment Station.
1974. **Leisure environments—now, 2000 and beyond.** USDA For. Serv. Northeast. For. Exp. Stn. 8 p., illus.

A look into the future of natural resource and use and management, predicting how we might work and play by the year 2050 and what policies and regulations we can expect. This brochure contains futuristic drawings that illustrate predictions by experts in environmental fields.

*Northeastern Forest Experiment Station.
1974. **Trees are . . . [environmental wonder workers].** USDA For. Serv. Northeast. For. Exp. Stn. 6 p.
A meteorological view of trees. This fold-out brochure tells how trees interact with the forces of nature—sun, wind, and rain—to modify earth's climate.

*ODell, T. M., P. A. Godwin, and W. B. White.
1974. **Radiographing puparia of tachinid parasites of the gypsy moth, and application in parasite-release programs.** USDA For. Serv. Res. Note NE-194. 4 p., illus.
A radiographic technique has been developed for observing and quantifying development and mortality of *Blepharipa scutellata* (Robineau-Desvoidy), *Parasetigena agilis* (Robineau-Desvoidy), and *Compsilura concinnata* (Meigen), tachinid parasites of the gypsy moth, *Porthetria dispar* (L.). Puparia can be examined and sorted immediately after collection, and decisions on further collecting and release can be made in the fall. Healthy tachinid pupae can be placed directly in a release area, eliminating the handling of adults the following spring.

Olson, David F., Jr., and W.J. Gabriel.
1974. *ACER* **L.: Maple.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 187-194, illus.
A description of this important genus, including growth habit, occurrence and use; flowering and fruiting; collection of fruits; extraction and storage of seeds; pregermination treatments and germination tests; and nursery practice.

Ostrander, M.D.
1974. **Eastern spruce . . . an American wood.** USDA For. Serv. Am. Woods Ser. FS-263. 10 p., illus.
Three spruce species—white, black, and red—grow in much of Canada and in the northeastern United States and are called collectively Eastern Spruce. The wood is moderately soft, medium to fine textured, and usually straight-grained; it is used for pulp, prefabricated dwellings, mobile homes, furniture, and construction. Spruce lumber has moderately high shrinkage, but it is easily dried and worked; it is low in nail-holding ability and resistance to decay.

*Parker, Johnson.
1974. **Seasonal changes in phenol-bound sugars in bark of some deciduous forest trees.** Can. J. For. Res. 4(3) : 291-295.
The prominent phenol-bound sugars in bark of the five tree species studied declined from winter to summer on a fresh, but not on a dry-weight basis. Rhamnose was the phenol-bound sugar occurring in greatest quantity in *Quercus velutina* and *Carya glabra,* xylose in *Betula lenta,* and glucose in *Fraxinus americana* and *Acer saccharum.* Glucose was a common phenol-bound constituent of all these species. Rhamnose, bound to phenols in *Quercus velutina,* made up as much as 2.5 percent of fresh weight in winter. Galactose and fructose, found in hydrolyzed ethanol-water extracts, originated largely from oligosaccharides.

*Parker, Johnson.
1974. **Effects of defoliation, girdling, and severing of sugar maple trees on root starch and sugar levels.** USDA For. Serv. Res. Pap. NE-306. 4 p.
Root starch levels of defoliated sugar maple trees, on the average, were lower after 4 weeks in two separate experiments than in girdled, cut off, or girdled and defoliated trees. Root starch levels in all these treatments were lower than in controls. Sucrose levels—but not the levels of fructose and glucose—followed the same trends. It is suggested that carbohydrates are moved upward in the phloem of the stem and to a lesser extent in the xylem in defoliated trees, and that this accounts for the relatively low levels of starch and sucrose in these trees' roots.

Parker, Johnson.
1974. **Seasonal changes in some bark pigments in** *Quercus velutina.* (Abstr.) Plant Physiol. Suppl. vol. 54 (June 1974) : 33.

Chloroplast pigments, including mostly chlorophylls, xanthophylls, and carotene, decreased in early summer and rose again in early winter. Phenolics, including tannins, changed very little over the same period. Most of the seasonal change in phenolics, when based on fresh weight, could be explained by changes in bark water content. Bark water content in winter was nearly half that in summer.

*Patric, James H.

1974. **River flow increases in central New England after the hurricane of 1938.** J. For. 72: 21-25, illus.

The New England hurricane of 1938 uprooted or broke off vast numbers of trees in watersheds of the Connecticut and Merrimack Rivers. Annual flow in both rivers increased about 5 inches during the first year after the hurricane. Another 5 inches of increased flow ran off at diminishing rates during the next 2 or 3 years. At least half of these flow increases occurred in July, August, and September, when streams normally are at the lowest levels of the year. There was no evidence of increased flow 5 years after the hurricane, when forest regrowth was well under way.

Patric, James H.

1974. **Water relations of some lysimeter-grown wildland plants in southern California.** 130 p., illus. USDA For. Serv. Northeast. For. Exp. Stn., Upper Darby, Pa.

An office report on lysimeter installations operated from 1937 until 1960 near Los Angeles. Diminished growth by lysimeter plants and disproportionately large surface runoff suggest that the lysimeter results can be applied to forested watersheds only with greatest caution. Later research methods provide more reliable knowledge of plant-water relationships at considerably less cost.

Patric, James H.

1974. **Soil water relationships in uncut and cut forests.** *In* Notebook for Logging Road and Skid Trail Workshops. W. Va. Univ. Coop. Ext. Serv. 9 p.

Logging roads and skid trails are by far the greatest sources of eroding soil and sediment from the eastern hardwood forest. This brief paper contrasts some soil-water relations before and after timber harvest. It was the basis of oral presentations on forest hydrology at a series of workshops on logging roads, providing take-off points for following speakers concerned with soils, engineering, and management of logging roads.

Payne, Brian R., and Jack W. Thomas.

1974. **Multiple Use: Who is the public and what are they saying?** Timber-Wildl. Manage. Symp. Proc.: 108-111. Mo. Acad. Sci. Occas. Pap. 3, Columbia, Mo.

Land managers have a professional responsibility to involve the public in multiple-use decisions. The public is increasingly urban, affluent, and educated, more concerned with wildlife than timber, and increasingly concerned with non-game and endangered species. Research is needed to identify the public and their changing needs.

Pearce, G.T., W.E. Gore, R.M. Silverstein, G.N. Lanier, J.B. Simeone, J.W. Peacock, R. Cuthbert.

1974. **Aggregation pheromone of the smaller European elm bark beetle,** *Scolytus multistriatus.* Int. Union Pure and Appl. Chem. Int. Symp. Chem. Nat. Prod. 9: 1E. Ottawa, Canada.

The pheromone of *Scolytus multistriatus* must be isolated, identified, and artificially synthesized before the attractant can be evaluated as a tool for control of this insect. The attractant blend has been isolated and the individual components identified as: (1) (—) 4-methyl-3-heptanol; (2) 2,4-dimethyl-5-ethyl-6, 8-dioxabicyclo (3.21) octane (multistriatin); and (3) (—) α-cubebene. Preliminary field studies indicate this mixture is attractive to beetles in flight. The synthetic attractant blend can now be evaluated in large-scale field tests to manipulate beetle populations and as a tool for beetle detection and survey.

Plass, William T.

1974. **Revegetation projects dominate surface-mine research.** Coal Min. & Process. 11(8): 40-42.

A review of the research accomplishments of the Forest Service and other research groups in West Virginia. Revegetation, which domi-

nated efforts in the past, will become less important. The development of practical land-management methods could dominate future research as more emphasis is placed on returning surface-mined lands to productive use.

*Plass, William T.

1974. **Factors affecting the establishment of direct-seeded pine on surface-mine spoils.** USDA For. Serv. Res. Pap. NE-290. 5 p., illus.

In a greenhouse study the emergence, survival, and growth of seven species of pine were related to chemical and textural characteristics of 12 Kentucky spoils. The results identify three factors that may affect the establishment of direct-seeded pine on surface-mine spoils. First, fine-textured spoil material may restrict seedling emergence. Second, species vary in their response to chemical and physical characteristics of the spoil material. Finally, the growth of loblolly pine was greater where the percentage of phosphorus in the whole plant was greatest.

Plass, William T.

1973. **Chemical soil stabilizers for surface mine reclamation.** *In* Soil erosion: causes and mechanisms; prevention and control. Highw. Res. Board Spec. Rep. 135: 118-122. (Workshop Conf. Proc.) Washington.

Two cooperative demonstrations compared vegetation establishment and erosion loss following 30 treatments with 6 mulches and 12 soil stabilizers. There is no evidence that these materials are necessary for vegetation establishment; they are used primarily to control erosion. Mulches, soil stabilizers, and soil stabilizer-mulch combinations were all found to be effective for this purpose.

*Plass, William T., and John P. Capp.

1974. **Physical and chemical characteristics of surface mine spoil treated with fly ash.** J. Soil and Water Conserv. 29(3): 119-121, illus.

The use of power-plant fly ash for surface-mine reclamation offers an attractive outlet for the millions of tons that are produced annually. Research by the U.S. Bureau of Mines indicates that large quantities of alkaline fly ash may lower bulk density, increase pore space, increase available water, add several plant nutrients, and neutralize acidity. In this study, the application of 150 tons of alkaline fly ash per acre significantly increased pH and soil phosphorous. Physical characteristics were also changed by the fly ash treatment. Spoil density was reduced and more soil moisture accumulated at lower depths. This indicates that the fly ash treatment increased infiltration rates, increased soil porosity, and increased percolation to a depth of 4 feet.

*Podgwaite, J.D., R.D. Neely, and R.T. Zerillo.

1974. **Reusable, autoclavable silicone rubber dish for insect dissection.** J. Econ. Entomol. 67(3): 458-459, illus.

A dissecting dish possessing the positive attributes of conventional wax and paraffin dishes was prepared, using a silicone encapsulant. Because the silicone remains rubbery from —65° to 250°C, the dish can be used for pathological studies, autoclaved, and reused many times. In addition, dissecting pins are held more firmly than in wax or paraffin and the silicone reseals when cut with a sharp instrument or when pins are removed. Although specifically designed for the dissection of insects, the dish could be adapted for use with other biological specimens.

*Pogge, Franz L., John D. Gill, and Bradford C. Bearce.

1974. **Rooting common and cat greenbrier.** USDA For. Serv. Res. Note NE-189. 6 p.

Because reliable methods for propagating greenbriers are needed for wildlife-habitat purposes, stem and rhizome cuttings of common and cat greenbrier and tubers of the latter species were tested. Common greenbrier is the better species for most wildlife-habitat uses. It proved fairly easy to propagate from either stem or rhizome cuttings. Similar cuttings from cat greenbrier failed, but tubers rooted well and can be collected at moderate cost. Kinds of cuttings to collect, when to collect them, nursery procedures, and relative costs are discussed.

Pogge, Franz L., John D. Gill, and Bradford C. Bearce.

1974. **Gibberellic acid inhibits greenbrier growth.** Tree Planters' Notes 25(2): 10.

Seeds of common and cat greenbrier (*Smilax rotundifolia* L. and *S. glauca* Walt.) moistened with distilled water germinated better than those moistened with 1, 50, or 100 ppm solutions of GA_3. Best germinations were 96 percent for common greenbrier after 9 months and 82 percent for cat greenbrier after 24 months.

Pottle, H.W., and A.L. Shigo.

1974. **Treatment of wounds on *Acer rubrum* with Trichoderma viride.** (Abstr.) Plants and Gard. 29(4) : 14-15.

Wounds on 90 *Acer rubrum* trees were inoculated with *Trichoderma viride* to determine the effects of the fungus on the development of decay. After a year 28 trees were harvested and 12 isolation chips were taken from the discolored or discolored and decayed wood associated with each wound. *Trichoderma viride* was reisolated from all wounds inoculated with it. No decay was associated with wounds inoculated with *T. viride* and no Hymenomycetes were isolated from the discolored wood associated with these wounds.

*Rast, Everette D.

1974. **Nonproductive time in hardwood mills.** South. Lumberman 229 (2843) : 13-15, illus.

Data on 6,083 logs sawed at 21 mills showed a total mill time of 363.9 hours and a total nonproductive time of 39.8 hours. The nonproductive time was analyzed, and the probable causes are discussed.

*Rast, Everette D.

1974. **Log and tree sawing times for hardwood mills.** USDA For. Serv. Res. Pap. NE-304. 17 p.

Data on 6,850 logs and 1,181 trees were analyzed to predict sawing times. For both logs and trees, regression equations were derived that express (in minutes) sawing time per log or tree and per Mbf. For trees, merchantable height is expressed in number of logs as well as in feet. One of the major uses for the tables of average sawing times is as a bench mark against which individual mills can make comparisons.

Rawson, James W.

1974. **Willows.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 147-149.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Rexrode, Charles O.

1974. **Effect of pressure-injected oxydemetonmethyl, cacodylic acid, and 2,4-D amine on elm bark beetle populations in elms infected with Dutch elm disease.** USDA Plant Dis. Rep. 58(4) : 382-384.

Oxydemetonmethyl, cacodylic acid, and 2,4-D amine were pressure-injected into the sap stream of diseased American elm trees to determine the effectiveness of these chemicals in preventing development of elm bark beetles. Oxydemetonmethyl and cacodylic acid effected virtually complete control, whereas, 2,4-D amine effected no control.

*Rexrode, Charles O., and James W. Lockyer.

1974. **Laboratory assay of cacodylic acid and Meta-Systox-R on *Scolytus multistriatus* and *Pseudopityophthorus* sp.** USDA For. Serv. Res. Note NE-190. 4 p.

Cacodylic acid and Meta-Systox-R were applied to oak and elm bark beetle diets. Diets containing 900 to 1,000 ppm of cacodylic acid and diets containing 100 to 200 ppm of Meta-Systox-R killed both oak and elm bark beetles.

Roach, Benjamin A.

1974. **Selection cutting and group selection.** State Univ. N.Y. Coll. Environ. Sci. and For. Appl. For. Res. Inst. Misc. Rep. 5. 9 p.

Most people (including many foresters) have a very hazy idea of what selection cutting is. This paper explains what it is, how it works, and what must be done in applying it to avoid the pitfall of fluctuating yields.

Roach, Benjamin A.

1974. **Scheduling timber cutting for sustained yield of wood products and wildlife.** Univ. Mo. Timber and Wildl. Manage. Symp. Proc.: 33-43, illus. [Mo. Acad. Sci. Occas. Pap. 3.]

Adjustment of presently unbalanced age distribution is necessary for sustained yield of both timber and wildlife from eastern hardwood forests, but wildlife production requires regulation by much smaller units (several hundred to several thousand acres). This need not be prohibitively expensive if the age distribution in the small units approaches that of the forest as a whole. The key to successful regulation is long-term planning of cutting schedules for small areas.

Robinette, Sadie L.

1974. **Checkerberry wintergreen.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 20-22.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Robinette, Sadie L.

1974. **Mountain-laurel.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 102-105.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Robinette, Sadie L.

1974. **Rhododendron.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 113-115.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Rogers, Robert.

1974. **Blueberries.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 12-15.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Rollins, James A.

1974. **Viburnums.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 140-146.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Romberger, John A.

1974. **Book review of "Plant physiology: A treatise,"** Vol. 6C. Physiology of development: From seeds to sexuality. For. Sci. 20: 214.

This book completes the original plan of a major treatise on plant physiology totalling 5,800 pages in 11 books published over a 12-year period. F.C. Steward, editor, stressed the great need for synthesis and recognition of emerging pattern or order. Chapter authors attempted to answer that need. The review comments on the relative success and value of their efforts. It is noteworthy that the authors of the final chapter intimate that, in spite of recent progress in molecular biology, the molecular approach does not yet even remotely explain development.

Romberger, J.A., and R.A. Gregory.

1974. **Analytical morphogenesis and the physiology of flowering in trees.** Third North Amer. For. Biol. Workshop Proc.: 132-147. Ft. Collins, Colo.

A new approach to the study of flowering in trees is proposed and discussed. The rationale is based upon a working hypothesis that flowering is basically an example of differential morphogenesis in vegetative sporophyte tissue. Such differential morphogenesis is based upon changes in rates and distributions of meristematic activity. The latter can be analyzed and quantified by methods already used by the authors to analyze vegetative development of *Picea* seedlings.

*Ross, Terence L., and George H. Moeller.

1974. **Communicating rules in recreation areas.** USDA For. Serv. Res. Pap. NE-297. 12 p., illus.

Five hundred fifty-eight campers were surveyed on the Allegheny National Forest to determine their knowledge of rules governing recreation behavior. Most of them were uninformed about the rules. Results of the study suggest that previous camping experience, age, camping style, and residence significantly affect knowledge of rules. Campers who received rule brochure or saw posted signs had significantly higher scores on knowledge of rules than others. Concentrating communication efforts on adolescents, tent campers, low frequency-of-visit campers, and non-locals might produce immediate gains in knowledge about rules.

Rudolf, Paul O., and W.B. Leak.

1974. *FAGUS* L.: **Beech.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 401-405, illus.

Describes the occurrence, geographic races, flowering and fruiting, seed collection and treatment, germination, and nursery practice for the genus *Fagus*.

Safford, L.O.

1974. **Effect of fertilization on biomass and nutrient content of fine roots in a birch-beech-maple stand.** Plant and Soil 40: 349-363.

Deep rooting by northern hardwood species is hampered by infertility and toxicity problems in acid subsoils. In this study a surface-applied fertilizer treatment enriched the soil and stimulated root production throughout the soil profile, a significant implication for fertilizer use by forest managers.

Safford, L.O.

1974. **Seasonal variation in growth and nutrient content of yellow birch layer roots.** Third N. Am. For. Biol. Workshop Proc.: 351. Colo. State Univ.

In this study, root layers were established on nine yellow birch trees, and layer roots were harvested over two growing seasons. Biomass production per active layer did not vary greatly within or between the two growing seasons. Conversely, concentration of each element measured—N,P,K,Ca,Mg,Fe,Mn,Zn, and Al—varied either within or between seasons or both. This technique is a promising research tool for studies of root and tree nutrition.

Safford, L.O.

1974. *PICEA* A. **Dietr.: Spruce.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 587-597, illus.

A summary of growth habit, occurrence, and uses; geographic races and superior strains; flowering and fruiting; extraction and storage of seed; pregermination treatments and germination tests; and nursery practice.

*Safford, L.O., and S.M. Filip.

1974. **Biomass and nutrient content of 4-year-old fertilized and unfertilized northern hardwood stands.** Can. J. For. Res. 4: 549-554.

Biomass and nutrient content of natural stands of northern hardwood regeneration were measured 4 years after clearcutting. Pin cherry and shrubs made up a significant proportion of the biomass in both unfertilized and fertilized stands. Yet these stands are well stocked with large numbers of desirable commercial species, especially paper and yellow birch. However, fertilizer greatly stimulated pin cherry to the detriment of the commercial species. Paper birch was the only commercial species to increase in average dry weight on the fertilized area.

*Safford, L.O., Alex L. Shigo, and Marilyn Ashley.

1974. **Gradients of cation concentration in discolored and decayed wood of red maple.** Can. J. For. Res. 4: 435-440, illus.

Concentrations of K, Mn, Ca, Mg, and Na were systematically measured along columns of discolored and decayed wood associated with drill hole wounds in red maple. The discolored and decayed wood contained higher concentrations of all elements than either adjacent clear wood in the same tree or clear wood of unwounded trees. Different patterns of distribution between the elements suggest that these elements may have different roles in the discoloration and decay process.

Sardo, William H. Jr., and Walter B. Wallin.

1974. **The performance of wooden pallets in pallet exchange programs.** Natl. Wooden Pallet and Container Assoc., Washington, D.C. 37 p.

Twenty variations of design of 48x40-inch pallets were monitored during commercial shipping operations for 3 years to determine performance characteristics and cost per use. Results showed that cost per use is least when the pallets are of high quality. High-quality pallets can be constructed of a normal quality mix of shook, provided the shook is sorted to use the best quality as end boards and stringers, with the lower quality in the center. All species of wood may be used to build high-quality pallets, but the fastening system must be compatible with the species.

Sarles, Raymond L.

1974. **Using and marketing bark residues in the United States.** IUFRO V Meeting Proc. 1973 vol. 2: 911-917, illus. Cape Town, Republic of South Africa.

Both conifer and hardwood tree barks are processed in large volumes in the U.S. for several types and grades of mulches and soil conditioners, and the market is apparently growing. Unprocessed bark residues are used for various purposes in agriculture, industry, and construction; and these uses are growing. The variety of ways in which bark residues are now used suggests a host of opportunities for wood processors seeking answers to bark-disposal problems.

*Sarles, Raymond L.

1974. **The use and value of wood and bark residues in the Northeast,** *or* **"Thar's gold in them thar bark piles".** North. Logger 23(2): 22-23, 38-39, illus.

A study of the uses and markets for bark and other wood residues revealed that there are profitable ways to dispose of these sawmill wastes. Processing and packaging residues can open up money-making markets for the sawmill operator. Bark and wood residues are cheap sources of fuel when compared to fossil fuels at today's prices.

Schemnitz, Sanford D.

1974. **Sweetfern.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 138-139.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Schopmeyer, C.S., and W.B. Leak.

1974. *OSTRYA VIRGINIANA* **(Mill.) K. Koch: Eastern hophornbeam.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 564-565, illus.

Describes occurrence, flowering and fruiting, seed collection and treatment, germination, and nursery practice for the species *Ostrya virginiana*.

Schreiber, Lawrence R., and John W. Peacock.

1974. **Dutch elm disease and its control.** USDA Agric. Inf. Bull. 193. 15 p., illus.

Information about Dutch elm disease and its elm bark beetle vectors. Included are discussions of the history of both the disease and the beetle, disease symptoms, and beetle life history. Special emphasis is given to the latest techniques for control of the beetles (including techniques for spraying elms with methoxychlor and for sanitation to remove beetle breeding sites), and techniques for control of root-graft spread of the disease. The planting of elms resistant to the disease is also discussed, and resistant varieties now available are described.

Schreiner, Ernst J.

1974. **Poplars can be bred to order for mini-rotation fiber, timber and veneer production and for amenity plantings.** Northeast. For. Tree Improv. Conf. Proc. 21: 85-96, illus.

A review of the distribution of the genus *Populus* and a discussion of genetic improvement possibilities based on environmental adaptability, growth rates, lack of barriers to species crossability within and between sections, and ease of clonal propagation. Suggests that the genus *Populus* offers greater possibilities for genetic improvement than any other genus of forest tree, and a major improvement effort is easily justified and long overdue.

Schreiner, Ernst J.

1974. *POPULUS* **L.: Poplar.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 645-655, illus.

A summary of growth habit, occurrence, and use; geographic races, ecotypes, clones, and hybrids; superior clones and cultivars; flowering and fruiting; collection, extraction, and cleaning of seeds; drying and storage of seeds; and germination.

Scott, E.G., B.C. Bearch, M.L. Cunningham, and G.W. Wood.

1973. **Out of the mighty oak the enchanting rose.** Rose Annu. 38: 148-153, illus.

In greenhouse trials at West Virginia University, tea roses grown in hardwood bark-sawdust (1:1) media yielded cut roses equivalent in number and quality to roses grown in standard rose soil mix and peat-vermiculite mix. Soluble N in the form of NH_4NO_3, or a slow-release fertilizer like Osmocote, is required in bark-sawdust growing media to

offset initial nitrogen drag from the bark and sawdust and to supply the plants. Feeding of iron chelate (2 ounces per 100 square feet every 2 months) is also recommended for hardwood bark-sawdust media to offset iron deficiency and resulting chlorosis in roses.

Seegrist, Donald W.

1974. **Statistical models and estimators of the proportion of volume by log position.** For. Sci. 20: 257-362, illus.

A conditioned regression model for the proportion of volume by log position was proposed previously. In it, estimates of the conditioned regression coefficients were calculated by a step-by-step application of least squares. This paper presents the statistical theory for the earlier procedures. The estimators are shown to be linear combinations of multivariate least square estimators of the average proportion of volume in each log position. Expressions for the covariance matrix of the estimator are derived. Simultaneous estimators of the conditioned regression coefficients are derived by multiple coefficients are compared, using volume measurements on peeler logs from 680 loblolly pines.

*Seegrist, Donald W.

1974. **Weighted regression analysis and interval estimators.** USDA For. Serv. Res. Note NE-195. 5 p., illus.

A method for deriving the weighted least-squares estimators for the parameters of a multiple-regression model. Confidence intervals for expected values and prediction intervals for the means of future samples are given.

*Seliskar, Carl E., Glenn E. KenKnight, and Carol E. Bourne.

1974. **Mycoplasmalike organism associated with pecan bunch disease.** Phytopathology 64: 1269-1272, illus.

Pecan bunch, a widespread and serious disorder throughout the commercial range of southern pecan, *Carya illinoensis,* was formerly presumed to be virus-induced, but the consistent association of a mycoplasmalike organism (MLO) with diseased and not with healthy trees strongly points to MLO etiology. Pecan bunch is not systemic throughout the tree. MLO, found in phloem sieve elements and companion cells of stems and leaves of affected trees, are most abundant in severely broomed material and are rarely observed in nonsymptomatic tissues. They are pleqmorphic, vary in size from 80 to 800 nm, contain ribosomal bodies and fibrillar material typical of DNA, and are delimited by a tripartite unit membrane. Spherical and oval forms are most common, but filamentous forms can be seen near sieve plates.

*Sendak, Paul E.

1974. **Analysis of pure maple syrup consumers.** USDA For. Serv. Res. Pap. NE-295. 11 p., illus.

Users of pure maple syrup who live in the syrup-producing area differ from consumers in other parts of the United States in their pattern of syrup use and purchase. This survey analyzes differences in user attitudes and habits and in the packaging and distribution of syrup.

*Sendak, Paul E., and Mariafranca Morselli.

1974. **Control of fancy maple syrup quality in the retail package.** Natl. Maple Syrup Dig. 13(4): 14-18, illus.

An experiment is described for determining the effects of retail containers on the quality of fancy-grade pure maple syrup. Storage temperature, light, and storage time were varied to test their effects on the syrup. If a good-quality fancy syrup is stored in the retail container at room temperature, and has been properly hotpacked, the quality of the syrup will be maintained satisfactorily for at least 6 months in all the containers tested.

Shafer, Elwood L., Jr.

1974. **The average camper who doesn't exist.** *In* Land & Leisure: concepts and methods in outdoor recreation: 112-129, illus.

A questionnaire survey of campers at five New York State campgrounds revealed that campers vary so much—not only from campground to campground, but also at the same campground from month to month—that data from such studies cannot be lumped together in any meaningful way. Causes of the variation are discussed. The author recom-

mends that future camper surveys should be stratified by months and similar campgrounds.

*Shafer, Elwood L., Jr., and George H. Moeller.

1974. **Through the looking glass . . . in environmental management.** Parks & Recreation 9 (2) : 20-23, 48-49, illus.

The trend of many institutions to incorporate some form of the word *environment* in their official titles typifies society's concern for the broad range of today's environmental issues. This paper is a think-piece for those professionals who would seriously address themselves to the integration of recreation with a broader range of environmental issues and policies—both today and in the future. Forecasts are made on related social, technological, and institutional events that are likely to occur in the future.

*Shafer, Elwood L., and George H. Moeller.

1974. **Wildlife priorities and benefits: now, 2000, and beyond.** North Am. Wildl. Nat. Resour. Conf. Trans. 39: 208-215.

In a survey, planners rated wildlife values high only for wildland management situations. For city recreation environments, wildlife values were rated low or negligible in priority. Probable social attitudes and events that may influence wildlife management in the future are described. Although hunting will continue for some time into the future as an important use of wildlife resources, nonconsumptive uses of wildlife will be the primary social value by the year 2000.

*Shafer, Elwood L., George H. Moeller, and Russell E. Getty.

1974. **Future leisure environments.** USDA For. Serv. Res. Pap. NE-301. 16 p., illus.

As an aid to policy- and decision-making about future environmental problems, a panel of experts was asked to predict the probabilities of future events associated with natural-resource management, wildland-recreation management, environmental pollution, population-workforce-leisure, and urban environment.

Shafer, Elwood L., George Moeller, Douglas A. Morrison, and Russell Getty.

1974. **Recreation, resources, and right decisions.** USDA For. Serv. Res. Pap. NE-293. 16 p., illus.

The authors present a series of relevance trees that pinpoint, in terms of interacting social and physical site variables, the important priorities in today's urban, rural, and wildland resource-management decisions. The results of this research provide a fairly simple structure for recreation managers to assess the effect of present and future social and political conditions on recreation planning and development decisions.

*Shafer, Elwood L., Jr., and Thomas A. Richards.

1974. **A comparison of viewer reactions to outdoor scenes and photographs of those scenes.** USDA For. Serv. Res. Pap. NE-302. 26 p., illus.

A color-slide projection or photograph can be used to determine reactions to an actual scene if the presentation adequately includes most of the elements in the scene. Eight kinds of scenes were subjected to three different types of presentation: (1) viewing the actual scenes, (2) viewing color slides of the scenes, and (3) viewing color photographs of the scenes. For each scene, responses to each of the three treatments were compared statistically and graphically.

Sharon, E.M.

1974. **Anaerobic environment enhances the detection of bacteria in tissues associated with wounds in living trees.** (Abstr.) Phytopathology 64: 585.

A total of 581 chips 2x2x5 mm were cut from discolored tissues of natural wounds on *Quercus alba, Q. rubra,* and *Acer rubrum,* and 324 chips from unwounded control trees. Chips were incubated for 5 days at 30°C, both aerobically and anaerobically on agar medium. Only 8 percent of the chips from control trees yielded bacteria, but yield of bacteria from chips from wounded trees doubled in each medium in the anaerobic environment.

*Sharon, E.M.

1974. **An altered pattern of enzyme activity in tissues associated with wounds in** *Acer saccharum.* Physiol. Plant Pathol. 4: 307-312, illus.

Sites of nicotinamide adenine dinucleotide (NAD)-linked respiratory activity in sugar maple tissues after wounding were shown by the histochemical localization of NAD diaphorase. The enzymic dehydrogenation of reduced NAD conjoined with the reduction of nitro-blue tetrazolium resulted in intracellular deposits of diformazans at sites of diaphorase activity. After wounding, diformazans formed in parenchyma cells contiguous with the wound and developed in previous years. Intense diformazan deposits formed in specific parenchyma "contact cells" that connected the vascular and parenchyma systems.

*Sharon, Edward M., and Alex L. Shigo.
1974. **A method for studying the relationship of wounding and microorganisms to the discoloration process in living trees.** Can. J. Forest Res. 4: 146-148, illus.

A plug was designed to allow the exchange of atmospheric air and moisture but suppress infection by microorganisms during the development of discoloration associated with wounds in living trees. The design is described.

Sharp, Ward M.
1974. **Ecology of shrubs and vines.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 2-5.

A discussion of the growth forms of shrubs and vines and the principal environmental factors that interact on them: (1) physical —sunlight, soil and moisture, temperature, and fire; and (2) biological factors—browsing, insects and diseases, and seed dispersal by animals.

Sharp, Ward M.
1974. **Hawthorns.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 59-64.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

*Shigo, Alex L.
1974. **A new look at decay in trees.** North. Logger 23 (4) : 10, 11, 38, 39.

A new expanded concept of decay and a new meter that detects decay in living trees gives new opportunities for control of decays, the major cause of damage to wood. Details on the concept and meter are given, especially as they relate to discoloration and decay in northern hardwoods.

*Shigo, Alex L.
1974. **Effects of manganese, calcium, zinc, and iron on growth and pigmentation of** *Trichocladium canadense, Phialophora melinii, Hypoxylon rubiginosum, Daldinia concentrica,* **and** *Cytospora decipiens.* Mycologia 66 (2) : 339-341.

Some of the fungi isolated most frequently from discolored wood associated with wounds in sugar maple, red maple, yellow birch, paper birch, American beech, and white ash, are *Trichocladium canadense, Phialophora melinii, Hypoxylon rubiginosum, Cytospora decipiens* and *Daldinia concentrica.* These fungi grew well in high concentrations of manganese, calcium, zinc, and iron. These fungi may be aggressive wound invaders because they have adapted to the high concentrations of minerals that accumulate in tissues as they die, discolor, and decay.

*Shigo, Alex L.
1974. **Relative abilities of** *Phialophora melinii, Fomes connatus,* **and** *F. igniarius* **to invade freshly wounded tissues of** *Acer rubrum.* Phytopathology 64: 708-710, illus.

Phialophora melinii, Fomes connatus, and *F. igniarius* were inoculated into wounds inflicted in *Acer rubrum* in June. After 12 weeks, *P. melinii* was isolated from 50 of 54 wounds inoculated with it. *F. connatus* was isolated from one wood chip of 874 from 72 wounds inoculated with it, and *F. igniarius* was not isolated. Bacteria, *Graphium* sp. and *Cytospora* sp. were isolated frequently. *Phialophora melinii, Graphium* sp., *Cytospora* sp., and bacteria were pioneer microorganisms infecting the type of wounds inflicted in *A. rubrum* in June, while *F. connatus* and *F. igniarius* were not.

*Shigo, Alex L., and Alex Shigo.
1974. **Detection of discoloration and decay in living trees and utility poles.** USDA For. Serv. Res. Pap. NE-294. 11 p., illus.

A method is described for detecting discoloration and decay in trees and utility poles. The electrical resistance to a pulsed current is less in decayed wood than in sound wood. A

meter has been developed, a "Shigometer", that delivers a pulsed current and measures the resistance to it. A probe attached to the meter by a flexible cable is inserted into a hole, 2.4 mm in diameter, drilled into the wood. When the probe tip is pushed inward and it moves from sound wood to discolored wood that is above the fiber-saturation point, the resistance measured in ohms on the meter decreases abruptly.

Shutts, Lynn M.

1974. **Summer grape.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 52-53.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Smith, Hanley K.

1974. **Sumacs.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 134-137.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Smith, Robert L.

1974. **Greenbriers.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 54-58.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Smithberg, Margaret.

1974. **Red-osier dogwood.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 44-47.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Smithberg, Margaret, and John D. Gill.

1974. **Roses.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 116-121.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Solomon, Dale S.

1974. **Simulation of the development of natural and silviculturally treated stands of even-aged northern hardwoods.** *In* Growth models for tree and stand simulation. IUFRO Work Party Proc. S4.01-4: 327-352, illus. Swed. R. Coll. For. Res. Note 30. Stockholm.

A description of a computer programming system developed to represent a summary and synthesis of appropriate data for simulating the development and treatment of even-aged northern hardwoods in New England.

Solomon, J.C., and C.J. Hay.

1974. **Annotated bibliography of the carpenterworm** *(Prionoxytus robiniae.)* USDA Forest Serv. Gen. Tech. Rep. SO-4. 13 p.

The carpenterworm, distributed widely throughout the United States and southern Canada, causes serious borer defect in the wood of living hardwood sawtimber, especially oak. Occasionally fruit trees and ornamentals are attacked. The bibliography was prepared for entomologists, foresters, and pest-control personnel.

*Sonderman, David L.

1974. **A simple and inexpensive pulsing device for data-recording cameras.** USDA For. Serv. Res. Note NE-183. 4 p., illus.

In some areas of forestry and wood-utilization research, use of automatic data-recording equipment has become commonplace. This note describes the basic electronic components needed to modify an existing intervalometer into a simplified pulsing device for controlling an automatic data-recording camera. The pulsing device is easily assembled and inexpensive when compared to similar proprietary units.

Spomer, L. Art.

1974. **How much hardwood bark is necessary for proper container-soil amendment?** For. Prod. J. 25(2): 57-59, illus.

Because particle shapes and sizes of hardwood bark soil amendment vary greatly between sources and lots, formulations for bark-soil container-growing media that are based on empirical trials are valid only for each lot of bark. This paper describes a method that overcomes this difficulty by predicting the porosity of any hardwood-bark soil mixture as an index for determining the optimum amount of bark to use. The concept is demonstrated with diagrams of bark-soil mixtures.

*Staley, David H., William R. Holt, and William N. Cannon, Jr.

1974. **Necessary and sufficient condition for a model insect population to go to extinction.** Bull. Math. Biol. 36: 527-533, illus.

A necessary and sufficient condition on the parameters for a model population to become extinct is presented. The mathematical model describes an insect population with overlapping generations where the females are polyandrous and the males are subject to autosterilization. The relationship between the values of the parameters of the model and the time to extinction is illustrated.

Stearns, Forest W.

1974. **Hazels.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 65-70.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Steinhagen, Hans-Peter.

1974. **Effect of kiln air velocity, at various moisture content levels, on drying rate of 4/4 yellow-poplar sapwood.** For. Prod. J. 24(4): 45-47, illus.

Economy in kiln-drying lumber necessitates the use of optimum air velocities for different levels of lumber moisture content. This study determined that for 4/4 yellow-poplar sapwood below 40 percent moisture content, satisfactory drying rates can be maintained with an air velocity of only 250 feet per minute. But at moisture contents above 40 percent, increasing the air velocity by about 500 feet per minute results in significantly faster drying rates.

Stern, E.G.

1974. **Design of pallet deckboard-stringer joints. Part 1: Aspen-pallet joints and aspen pallets.** Va. Polytech. Inst. and State Univ. Wood Res. and Wood Constr. Lab., Pallet and Container Res. Cent. 126. 48 p., illus.

Aspen lumber is representative of the lighter wood species readily available for pallet manufacture in many localities. Aspen pallets can be made 1⅓ times stiffer and 1 1/5 times more rigid than oak pallets and thus have an increased service life if wider aspen stringers are used and if the leading-edge deckboards are fastened with more and larger nails.

Stern, E.G.

1974. **Recent pallet fastening research can reduce pallet costs.** Va. Polytech. Inst. and State Univ. Wood Res. and Wood Constr. Lab., Pallet and Container Res. Cent. 128. 8 p., illus.

The advantages are presented of using hardened-steel 3-inch versus 2½-inch pallet nails; pallet nails with four helical thread flutes versus nails with five flutes; helically threaded versus helically fluted hardened-steel nails; and plastic-polymer coated 2½-inch, 15-gage, 7/16 inch crown pallet staples.

Stern, E. George, and Walter B. Wallin.

1974. **How pallets stand.** Purch. World 18 (9): 68.

Although the supply of wooden pallets has improved, it is expected to remain snug over the next few years. It is suggested that pallet users take a closer look at the economics of pallet use. Pallet life increases much faster than price, up to $10 per pallet. Therefore better and more expensive wooden pallets cost less per use. Compared with other materials, wooden pallets still offer a hard-to-beat economic advantage.

Tabor, Christopher A.

1974. **Review of "The life history of Douglas-fir",** by George S. Allen and John N. Owens (1972). For. Sci. 20: 104.

This book was prepared by John N. Owens on the basis of materials left by the late George S. Allen. This collection was richly supplemented by Owens' own experience and materials. The result is a comprehensive treatise of great value to developmental biologists and to many other forest scientists as well. The book includes an impressive collection of photographs.

Tabor, Christopher A.

1974. **Review of "Organogenesis of flowers: A photographic text-atlas",** by Rolf Sattler (1973). For. Sci. 20: 56.

This book is a photo-atlas arranged as a catalog of angiosperm floral parts in various stages of development. More than 1,000 photographs illustrate the diverse forms that the organs can take and also convey a sense of

dynamics. The descriptive text emphasizes sequential changes and makes a useful technical book of what otherwise might appeal mostly as an art collection.

Talerico, R.L., and T.A. Skratt.

1974. **Gypsy moth defoliation: can we segregate damage levels from aerial photographs?** Univ. Maine and Am. Soc. Photogramm. 4th Bienn. Workshop Color Aer. Photogr. Proc. 1973: 233-234. Orono, Maine.

The authors describe the defoliation of hardwood stands by the gypsy moth (*Porthetria dispar* L.) and the development of a method for characterizing this defoliation. A brief account of the history of the gypsy moth, its seasonal development, and the gypsy moth research and development program are presented, ending with some ideas and questions about attacking this problem.

Thomas, Jack Ward, and Richard M. DeGraaf.

1974. **Raccoons on the roof.** *In* Gardening with wildlife: 153-168. Natl. Wildl. Fed., Washington, D.C. 190 p.

Advice to homeowners who have problems with wildlife around their property. Methods are suggested for keeping birds and mammals out of attics, gardens, and lawns. Wildlife provides pleasures that far outweigh the minor problems that occasionally arise and that normally can be prevented easily and inexpensively.

Thomas, Jack Ward, Richard M. DeGraaf, and Joseph C. Mawson.

1974. **A technique for evaluating bird habitat.** *In* Wildlife in an urbanizing environment: 159-162. Univ. Mass. Holdsworth Nat. Resour. Cent. Plann. and Dev. Ser. 28. Amherst.

A method was developed for studying habitats of several songbird species simultaneously. Ten species were censused 9 times at 80 roadside plots in Amherst, Mass., and habitat attributes were measured. The vegetative layers whose volumes were significantly correlated with the abundance of each species were designated as important habitat variables. Other habitat characteristics are also discussed.

Thomas, Jack Ward, and Ronald A. Dixon.

1974. **Cemetery Ecology.** *In* Wildlife in an urbanizing environment: 107-110. Univ. Mass. Holdsworth Nat. Resour. Cent. Plann. and Dev. Ser. 28. Amherst.

Urban cemeteries provide scarce open space that can be managed for recreation and wildlife to benefit urban people. During 200 hours of study, several thousand people were observed participating in more than two dozen recreational activities in 50 Boston cemeteries. Ninety-five bird and 20 mammal species were identified. Deliberate management can enhance recreation and wildlife values of cemeteries.

*Timson, Floyd G.

1974. **Weight and volume variation in truckloads of logs hauled in the central Appalachians.** USDA For. Serv. Res. Pap. NE-300. 9 p., illus.

Discusses the variation in weight and volume found among loads of logs hauled by truck in the central Appalachian Mountains. Elements that can cause load variation are discussed. Recommendations for reducing variation and increasing payload are included.

Townsend, A.M., and L.S. Dochinger.

1974. **Relationship of seed source and developmental stage to the ozone tolerance of *Acer rubrum* seedlings.** Atmos. Environ. 8: 957-964.

Air-pollution damage to trees is of increasing economic and biological importance. Significant tolerance to ozone was demonstrated by red maple progenies. The stability in response to ozone fumigation during various plant and leaf ontogenetic stages signifies strong genetic control. These findings will facilitate the selection of ozone-tolerant seed sources and seedlings of red maple trees.

*Trimble, G. R., Jr.

1974. **Response to crop-tree release by 7-year-old stems of red maple stump sprouts and northern red oak advance reproduction.** USDA For. Serv. Res. Pap. NE-303. 6 p.

Study results from a crop-tree release of red maple stump sprouts and northern red oak

advance reproduction in a 7-year-old hardwood stand on a fair site indicated that the release: (1) had no effect on the height growth of either species; (2) did positively favor diameter growth of the red maple, but did not affect diameter growth of the red oak; and (3) had little effect on crown position of red oak, but favored retention of dominance among codominant red maple sprouts.

*Trimble, George R., Jr., Joseph J. Mendel, and Richard A. Kennell.

1974. **A procedure for selection marking in hardwoods combining silvicultural considerations with economic guidelines.** USDA For. Serv. Res. Pap. NE-292. 13 p., illus.

This method of applying individual-tree selection cutting in hardwood stands incorporates silvicultural considerations with economic guidelines for selecting trees for cutting. The economic guidelines are rates of return, which were developed from growth and tree-quality data for nine major species. Actual tree stumpage values were determined, working back from standard lumber prices, by deducting conversion costs.

*Trimble, George R., Jr., James H. Patric, John D. Gill, George H. Moeller, and James N. Kochenderfer.

1974. **Some options for managing forest land in the central Appalachians.** USDA For. Serv. Gen. Tech. Rep. NE-12. 42 p., illus.

The multiple-use principle has been recognized by many people and for many years as a desirable approach to forest management. This publication is intended to present multiple-use options for managing forest land in the central Appalachians. These multiple-use options are presented by ecosystems for the following forest uses: timber, water, visual appeal, and wildlife.

*Trimble, G.R., Jr., and E.H. Tryon.

1974. **Grapevines a serious obstacle to timber production on good hardwood sites in Appalachia.** North. Logger 23(5): 22, 23, 44, illus.

Wild grapevines are damaging to timber production in Appalachian hardwood stands. Although grapevines reproduce by both seeds and sprouts, damage from sprouts is more serious because they grow so much faster than seedlings. Because grapevines are shade intolerant, they are much more of a problem after clearcutting than after selection cutting. Grapevines are more common on the better sites.

Troendle, C.A., G.M. Aubertin, and J.N. Kochenderfer.

1974. **Decomposition of the forest floor following deforestation and annual herbiciding.** Agron. Abstr. Am. Soc. Agron. Meet. Div. S-7: 179.

Half of a 23-ha watershed was deforested and annually treated with herbicides to prevent regrowth. Samples of the L, F and H, A_1 (0-7.5 cm), and A_3 (7.5-15.0 cm) horizons were collected for 4 years. The litter (L) was depleted after the first year. Loss on ignition in the F and H, A_1, and A_3 horizons and root weight decreased linearly with time. Settling increased the weight of mineral soil sampled in the fixed volume, resulting in little if any net change in organic matter in the upper 15 cm of mineral soil.

Vilkitis, James R.

1974. **Cherries.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 23-25.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Vogel, Willis G.

1974. **All-season seeding of herbaceous vegetation for cover on Appalachian strip-mine spoils.** Natl. Coal Assoc. Res. & Appl. Tech. Symp. on Mined-Land Reclaim. Proc. 2: 175-188. Louisville, Ky.

Mixtures of temporary (quick cover) and long-lived (permanent) herbaceous species were sown periodically throughout the year on strip-mine spoils in eastern Kentucky. Fair to excellent cover was established within 45 to 60 days after seeding from March 1 to October 15, although establishment was a little slower for some of the seedings made in July and August. Seedings in December and February were less successful than those in March and April. Seedbed preparation is essential for successful establishment of seeded vegetation.

Vogel, Willis G.

1974. *LESPEDEZA* **Michx.: Lespedeza.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 488-490, illus.

A brief description of this genus, including growth habit, occurrence, and use; superior strains; flowering and fruiting; collection of fruits and extraction and storage of seed; pregermination treatments; germination tests; and nursery and field practices.

*Vozzo, J.A., and Edward Hacskaylo.

1974. **Endo- and Ectomycorrhizal associations in five *populus* species.** Torrey Bot. Club Bull. 101 (4) : 182-186, illus.

After inoculation with mycorrhizal fungi in soil, *Populus fremontii, P. grandidentata,* and *P. tremuloides* formed ectomycorrhizae; *P. heterophylla* formed no mycorrhizae; *P. deltoides* and *P. deltoides* var. occidentalis formed both ecto- and endomycorrhizae. Spores isolated from endomycorrhizal *P. deltoides* appear to be *Endogone* species. Respiration rates of *P. deltoides* were 2.8μ 1 0_2/mg/hr for nonmycorrhizal roots and 3.0μ 1 for endomycorrhizae. Histochemical differences in the two kinds of roots suggest that protein synthesis is more active with mycorrhizae than with nonmycorrhizal roots.

Wallin, W.B., and E.G. Stern.

1974. **Tentative nailing standards for warehouse and exchange pallets.** Va. Polytech. and State Univ. Wood Res. and Wood Constr. Lab., Pallet and Container Res. Cent. 129. 16 p., illus.

When wood species of different densities are used for the construction of wooden pallets, different sizes and numbers of nails are, under given conditions, needed to assemble pallets of comparable strength. The standards presented are recommended for use in designing pallets for specific performance requirements.

*Walters, Russell S., and William J. Gabriel.

1974. **Sugar maple sap-flow rate and sap volume.** Natl. Maple Syrup Dig. 13(3) : 12-14, illus.

Sap-flow rate is closely correlated with the sap volume produced by dormant sugar maple trees and can be used in making phenotypic selections of trees for superior sap production.

Walton, G.S., and C.J. DeMars.

1974. **Empirical methods in the evaluation of estimators.** *In* Statistics in forestry research: 161-164. IUFRO Fourth Conf. Advis. Group For. Stat. Vancouver, B.C.

The authors discuss the problem of selecting estimators of density and survival by making use of data on a forest-defoliating larva, the spruce budworm. Various estimators are compared. The results show that, among the estimators considered, ratio-type estimators are superior in terms of bias and variance. The methods used in making comparisons, particularly simulation, are generally applicable to situations in which data appropriate for making estimates are on hand.

Wargo, Philip M.

1974. **Lysis of the cell wall of *A. mellea* by enzymes from forest trees.** (Abstr.) Phytopathology 64: 588.

Chitinase and ß,1-3, glucanase were extracted from healthy tissue of both stem and root of sugar maple, red oak, black oak, and white oak. Yields were higher from the inner bark. Enzyme extracts, concentrated by ammonium sulfate precipitation, dissolved the cell wall of *Armillaria mellea.* The presence of these enzymes in trees and their ability to lyse the cell walls of *A. mellea* suggest a system in trees that may account for the resistance of healthy tissues to invasion by *A. mellea* and possibly other organisms.

Wargo, Philip M., and David R. Houston.

1974. **Infection of defoliated sugar maple trees by** *Armillaria mellea.* Phytopathology 64: 817-822, illus.

Manually-defoliated and insect-defoliated trees were inoculated with *Armillaria* mellea to determine the influence of time of season and frequency of defoliation on root invasion by the fungus. Insect populations collapsed and caused only light defoliation. This resulted in a low incidence of infection of trees by *A. mellea* and low tree mortality. Manual defoliation in June or July resulted in more infections and higher mortality than did manual defoliation in August. The incidence of infection was higher when trees were defoliated for two consecutive years than when they were defoliated once. Not all dead trees were infected by *A. mellea.* There was evi-

dence that *Stegonosporium ovatum* may hasten death of stem tissues severely stressed by defoliation.

Wartluft, Jeffrey L.

1974. **Baling hardwood bark with a vertical baler.** North. Logger 22(12) : 22, illus.

The vertical baler, designed to bale peat moss and similar materials, can also be used to bale hogged hardwood bark for use as mulch. A plastic-covered bale holds about 4 cubic feet of compressed bark versus 3 cubic feet of loose bark in a bag—a cost saving in packaging.

*Wartluft, Jeffrey L.

1974. **Yield table for hardwood bark residue.** USDA For. Serv. Res. Note NE-199. 4 p., illus.

Bark residue weights are tabulated for eight species of hardwood sawlogs according to log volume by the Doyle International ¼-inch and Scribner decimal-C log rules. Factors are provided for converting from weight in pounds to volume in cubic yards.

Watt, Richard F., Kenneth A. Brinkman, and B.A. Roach.

1973. **Oak-hickory.** *In* Silvicultural systems for the major forest types of the United States. USDA For. Serv. Agric. Handb. 445: 66-69.

A primer of basic silviculture applicable in the oak-hickory type of the east-central United States.

Wendel, G.W.

1974. *CELASTRUS SCANDENS* **L.: American bittersweet.** *In* Seeds of woody plants in the United States. USDA Agric. Handb. 450: 295-297, illus.

Growth, habit, occurrence, and use of *Celastrus scandens* L. are described, as well as the phenology, collection of fruit, extraction, and storage of seed. Pregermination treatments, germination testing, and nursery practices are also described.

*Wendel, George W., James N. Kochenderfer, and Cleveland J. Biller.

1974. **Skyline cable logging in West Virginia.** North. Logger 22(12) : 14-15, illus.

This article describes a trial of a mobile skyline cable logging system in the Appalachian Mountains of north-central West Virginia. Logs were yarded from a clearcut area and a selectively-cut area with minimal surface disturbance. Residual stand damages in the selectively-cut area was judged to be less than with other logging methods. Logs were yarded from 75 feet on each side of the skyline in the selectively-cut area and from 100 feet in the clearcut area. With an experienced 5-man crew, set up and take-down can be accomplished in 2 to 3 hours. The major advantage of the system is the elimination of many closely-spaced skid roads when logging in steep mountain terrain.

White, James R., and William T. Plass.

1974. **Sediment control using modified mining and regrading methods and sediment control structures.** Second Res. & Appl. Technol. Symp. on Mined-Land Reclam. Proc.: 117-123. Louisville, Ky.

Effective sediment control on surface-mined lands requires detailed planning before permit application and systematic implementation of all plans. In this case history, mining plans included head-of-the-hollow fills, control of outslope length, and controlled placement of overburden materials. Sediment-control impoundments removed 60 percent of the suspended solids resulting from low- to moderate-intensity storm events. These structures were not effective for high-intensity storms.

Wilkinson, Ronald C.

1974. **Realized and estimated efficiency of early selection in hybrid poplar clonal tests.** Northeast. For. Tree Improv. Conf. Proc. 21: 26-32.

Hybrid poplar clonal tests were evaluated for effectiveness of early selection for mature (15-year) height and for comparing predicted and observed mature responses to early selection. Selection of hybrid poplar clones for total height at 1 or 4 years in clonal tests may result in negative selection differentials at 15 years. Broad-sense heritabilities and genetic correlation are reliable for predicting the mature response to early selection, but they are applicable only to a limited range of sites and genotypes.

Williamson, Robert D.

1974. **Birds in Washington, D.C.** *In* Wildlife in an urbanizing environment: 131-136. Univ. Mass. Holdsworth Nat. Resour. Cent. Plann. and Dev. Ser. 28. Amherst.

The occurrence and distribution of songbirds was measured in neighborhoods adjacent to Rock Creek Park in Washington, D.C. Species included cardinals, mockingbirds, catbirds, wood thrushes, house sparrows, pigeons, starlings, robins, blue jays, and song sparrows. The number of birds seen was correlated with vegetative, socioeconomic, and demographic variables.

Wilson, C.L., and A.L. Shigo.

1974. **Dispelling tree myths.** Plants and Gard. 29(4): 14-15.

Some practices in arboriculture are based wholly or partly on myth rather than scientific facts. For example, one myth is that goose eggs placed around the roots of an elm tree will cure it of Dutch elm disease (for which there is no known cure). Filling a cavity in a tree will not stop decay. Wound dressings do not stop decay development. More research and scientific facts are needed rather than myths.

Wodzicki, T.J., and Alina B. Wodzicki.

1973. **Auxin stimulation of cambial activity in *Pinus silvestris*. II. Dependence upon basipetal transport.** Physiol. Plant. 29: 288-292.

The natural auxin content in the cambial region of large *Pinus silvestris* trees was determined at intervals throughout the year. No significant seasonal change in concentration of extractable auxin could be detected. Decapitation and girdling experiments produced severe reductions in cambial activity and in auxin level. The activity pattern of extracted pine auxin was not the same as that of synthetic indole-acetic aicd as determined by bioassays.

Wodzicki, T.J., and S. Zajaczkowski.

1973. **Effect of auxin on xylem tracheids differentiation in decapitated stems of *Pinus silvestris* L. and its interaction with some vitamins and growth regulators.** Acta Soc. Bot. Pol. 43: 129-148.

The possible basis of the seasonal variation in response of cambium or differentiating tracheids to auxin was studied by applying known substances in lanolin to the cut surfaces of decapitated trees. None of the effects obtained was significant enough to indicate involvement in seasonal changes in responsivity. Some of the results, however, are relevant to clarifying the role of auxin in tracheid development.

*Wolf, Charles H.

1974. **The effect of monetary incentives on absenteeism: a case study.** USDA For. Serv. Res. Pap. NE-291. 4 p.

An attendance bonus paid by a wood-processing firm was studied to determine its effectiveness in reducing absenteeism. Employees were divided into permanent and short-term groups, and their responses to the bonus were studied, using nonparametric tests. The evidence suggested that the incentive favorably influenced the work attendance of only the permanent group. Recommendations are made for future research.

Wolgast, Leonard J.

1974. **Bear oak.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 108-110.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Wollerman, Edward H.

1974. **Elm bark beetle dispersal studies.** Entomol. Soc. Am. North Cent. Branch Annu. Meet. 29: 177. Des Moines, Iowa.

Dispersal of the smaller European elm bark beetle in a 100-acre treeless area was investigated by tagging large numbers with P-32 and releasing. Dispersal was determined by use of 40 traps holding freshly infested elm wood as an attractant. In three releases the recoveries were 1 percent to 5 percent. About half the recoveries were in the nearest eight-trap circle of 264 feet radius. The remainder were found in almost every trap up to ¼ mile away.

Wood, Gene W.

1974. **Witch-hazel.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 154-157.

A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Wood, Gene W.
1974. **Common spicebush.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 129-131.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

*Worley, David P.
1974. **A handy guide to rate of increase interpretations.** USDA For. Serv. Res. Note NE-187. 3 p.
Compound interest tables are reduced to a single 3x5 card for field use. Examples are given to illustrate the table's use.

Worley, D. Michael, and Charles M. Nixon.
1974. **Elders.** *In* Shrubs and vines for Northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9: 48-51.
A brief description of the range, habitat, life history, use by wildlife, propagation, and management.

Wu, Kent Y-t., and E.A. McGinnes, Jr.
1974. **Intra-incremental studies of methylation in scarlet oak.** Wood Sci. 7(2): 92-98.
A scarlet oak tree was sectioned, and comparisons were made across and between growth rings for content of lignin, lignin methoxyl, and wood methoxyl. Lignin content followed by hemicellulose methoxyl content are the most important variables for determining wood methoxyl content. Latewood lignin contained more methoxyl than earlywood lignin. However, no differences were established between sapwood and heartwood zones for the sampled tree.

*Yawney, Harry W., and Clayton M. Carl, Jr.
1974. **Storage requirements for sugar maple seeds.** USDA For. Serv. Res. Pap. NE-298. 7 p., illus.
Sugar maple seeds, collected from three trees in northern Vermont, were stored at four temperatures (18, 7, 2 and —10°C) in combination with four seed moisture contents (35, 25, 17 and 10 percent). Seed moisture content and storage temperature significantly affected keeping ability, and these factors were highly interrelated. Seeds from all trees kept best at the lowest temperature and lowest moisture content tested.

Yawney, Harry W., and Edward P. Johnson.
1974. **Protecting planted sugar maple seedlings from deer browsing.** Hardwood Res. Counc. Annu. Hardwood Symp. 2. Cashiers, N. C.
Animal damage is a major factor affecting the success of hardwood plantings. The devices tested in this study—straight wire, metal shield, and wire spines—were not effective in protecting planted 2-0 sugar maple seedlings from deer browsing. It was concluded that an alternative might be to use planting stock that is at least 6 feet high.

Zajaczkowski, Stefan.
1973. **Auxin stimulation of cambial activity in *Pinus silvestris*. I. The differential cambial response.** Physiol. Plant. 29: 281-287.
Isolated stem segments of *Pinus silvestris* produce new xylem for about 5 weeks in sterile culture if sucrose and auxin are supplied. The response of the cambium varies with the seasons and with the position on the tree from which the segment was taken. The relation between concentration of auxin and activity of the cambium, however, is complex and involves changes in responsivity of the cambium to auxin.